1918

# Official Publication of Iowa State College of Agriculture and Mechanic Arts General Catalogue

Iowa State University

OFFICIAL PUBLICATION OF
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

Vol. XVI
APRIL 3, 1918
No. 44

# General Catalogue

## 1918-1919

Ames, Iowa

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# CALENDAR

## 1918

### JANUARY

| S | M | T | W | T | F | S |
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| .. | .. | 1 | 2 | 3 | 4 | 5 |
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### FEBRUARY

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### MARCH

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### APRIL

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## 1919

### JANUARY

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### FEBRUARY

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### MARCH

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### APRIL

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### JUNE

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TECHNICAL EDUCATION makes strong claim upon the interest of young men and women who are weighing the questions whether they shall go to college, and, if they go, where?

It has a right to claim that interest.

At war or at peace, America and the world must have in the immediate future a much larger number of men and women who are technically trained. No other need is greater.

In these times when the nation is so deeply stirred with patriotic ardor and large armies are being raised there is danger of a lack of men and women to organize and lead, to feed and clothe, to equip and transport, and to devise new ways and improve old ways of doing these tasks. On the farms and railroads, in the mills and shops, in the laboratories and in the home, a struggle is being waged, which, like unto Verdun, is vital to the cause, for the Verduns, after all, rest back upon the skill that is brought to bear in the doing of things behind the lines, and that skill is the fruit of such scientific training as the technical college can give.

In the times of peace that lie ahead, the world must be restored from chaos to order and be reclaimed from destructiveness to productiveness. That again demands the leadership and skill in doing things that come through technical training of a high order.

Unless the youth of today prepare themselves, through the technical colleges, for leadership in doing the great tasks that must be done in the next generation, there will be a blind groping and stumbling toward achievement that will be disastrous. Europe cannot meet the call for technically trained men and women, because most of its technical institutions are closed by the war. America must assume this duty as well as the others already taken over.

This is not merely a duty, however, but an opportunity as well, for the great host of young men and women coming out of the preparatory schools each year.

This catalogue describes many courses of study which open a straight and true roadway to large and certain usefulness in technical fields in which there is great need for men and women of thorough preparation. Linked with each of the courses for men are courses in military science and tactics which give excellent preparation for service in various branches of the army.

In *agriculture* these courses give an education for leadership in bringing about the increased and more efficient production that the world must have or go unfed and unclothed.

In *engineering* the instruction trains for positions of responsibility in planning, designing, building, and organizing in the fields of transportation, communication, industry, and trade.

In *home economics* the instruction not only helps women to meet their home and community responsibilities in a larger and better way, but it also prepares them for teaching and leadership in the many new fields that have been opened to women in the past few years.

In *industrial science courses,* men and women are prepared to become the specialists that industry and business must have in larger numbers if they are to cope successfully with new problems in production and meet new conditions in competition.

In *veterinary medicine* the training fits men to become practitioners in a field that is today short of competent men and it also opens excellent opportunities in public service.

The demand from the technical fields for men and women with thorough scientific training must be filled. The young men and women who graduate from the high schools and other preparatory schools this year must give heed to the claim of technical education. If they do not, the work of the world is sure to suffer. But the call of the technical college is not merely one of duty; it also offers agreeable pursuit of knowledge and assurance of both useful and profitable service after a technical course has been completed.

# Contents

# College Calendar

# 1918-1919

The General College Faculty meets on the third Monday of each month at 4 P. M in Central Building. The faculties of the different divisions meet during the week of the first Monday of each month, as follows:

Monday, 4 P. M.----------Home Economics
Tuesday, 4 P. M.----------Veterinary Medicine
Wednesday, 4 P. M.----------Engineering
Thursday, 4 P. M.----------Agriculture
Friday, 4 P. M.----------Industrial Science

This calendar is subject to change at any time, to meet war emergencies.

## FIRST SEMESTER

| | |
|---|---|
| September 19-20, Thursday and Friday, 8:00 A. M. | Entrance Examinations. |
| September 21-23, Saturday, 8:00 A. M., to Monday, 5:00 P. M. | Registration-Classification Days. |
| September 24, Tuesday, 7:40 A. M. | College Work begins. |
| September 28, Saturday, 8:00 P. M. | Y. W. C. A. and Y. M. C. A. Reception. |
| October 5, Saturday, 8:00 P. M. | Junior Trot. |
| October 12, Saturday, 8:00 P. M. | Agricultural Reception. |
| October 19, Saturday, 8:00 P. M. | Sophomore-Freshman Annual. |
| November 22, Friday, 8:30 P. M | Y. W. C. A. Party. |
| November 28, Thursday | Thanksgiving Vacation. |
| December 20, Friday, 11 A. M. | Christmas Vacation begins. |
| December 31, Tuesday, 12:00 M. | Vacation closes. |
| January 24, Friday, 11 A. M. | First Semester closes. |

## SPECIAL SHORT COURSES AND CONVENTION WEEK

JANUARY 27, MONDAY, TO FEBRUARY 1, SATURDAY

## SECOND SEMESTER

| | |
|---|---|
| January 30-January 31, Thursday and Friday, 8:00 A. M. | Entrance Examinations. |
| February 3, Monday, 8:00 A. M. to 5:00 P. M. | Registration-Classification Day. |
| February 4, Tuesday, 7:40 A. M. | College Work begins. |
| February 8, Saturday, 8:00 P. M. | Y.W.C.A. and Y.M.C.A. Reception. |
| March 8, Saturday, 8:00 P. M. | Freshman-Sophomore Annual. |
| March 14-15, Friday, 1:00 P. M. to Saturday, 12:00 M. | Engineers' Open House. |

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|---|---|
| March 15, Saturday, 8:00 P. M. | Engineers' Ball. |
| May 3, Saturday, 8:00 P. M. | Military Ball. |
| May 2, Friday, 3:30 P. M. | May Day Fete. |
| May 23, Friday, 8:00 P. M. | Semester Musical Recital. |
| May 24, Saturday, 8:00 P. M. | Senior Promenade. |
| May 25, Sunday, 10:30 A. M. | Baccalaureate Sermon. |
| May 26, Monday, 2:00 P. M. | Graduation Exercises of Literary Societies. |
| May 27, Tuesday, 9:30 A. M. | Alumni Business Meeting. |
| May 27, Tuesday, 1:00 P. M. | Alumni, Faculty, Senior Banquet. |
| May 27, Tuesday, 8:00 P. M. | Senior Class Play. |
| May 28, Wednesday, 10:30 A. M. | Commencement. |
| May 28, Wednesday, 2:30 P. M. | President's Reception. |

## SUMMER SESSION

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|---|---|
| June 2, Monday, 7:00 A. M. | Summer School begins. |
| August 21, Thursday, 12:00 M. | Summer School closes. |

## FIRST SEMESTER, 1919-1920

| | |
|---|---|
| September 18-19, Thursday and Friday, 8:00 A. M. | Entrance Examinations. |
| September 22, Monday, 8:00 A. M., to 5:00 P. M. | Registration-Classification Day. |

COLLEGE CALENDAR
(CHANGED TO QUARTER BASIS)
FIRST QUARTER:
October 1, 1918 to December 21, 1918
SECOND QUARTER:
December 30, 1918 to March 22, 1919
THIRD QUARTER:
March 31, 1919 to June 21, 1919

# Iowa State Board of Education

D. D. MURPHY, President ..... Elkader
W. H. GEMMILL, Secretary ..... Des Moines

## MEMBERS OF BOARD

TERMS EXPIRE JULY 1, 1919

P. K. Holbrook ..... Onawa
Chas. R. Brenton ..... Dallas Center
D. D. Murphy ..... Elkader

TERMS EXPIRE JULY 1, 1921

Paul Stillman ..... Jefferson
Edw. P. Schoentgen ..... Council Bluffs
Frank F. Jones ..... Villisca

TERMS EXPIRE JULY 1, 1923

Geo. T. Baker ..... Davenport
H. M. Eicher ..... Washington
Willard C. Stuckslager ..... Lisbon

## STANDING COMMITTEES

Faculty Committee—D. D Murphy, P. K. Holbrook, H. M. Eicher, Paul E. Stillman, W. C. Stuckslager.

Building and Business Committee—Chas. R. Brenton, D. D. Murphy, Edw. P. Schoentgen, Geo. T. Baker, F. F. Jones.

## FINANCE COMMITTEE

W. R. Boyd, Chairman ..... Cedar Rapids
Thos. Lambert ..... Sabula
W. H. Gemmill, Secretary ..... Des Moines

## INSPECTOR OF SECONDARY SCHOOLS

John E. Foster, Inspector ..... Des Moines

# Officers of Administration

GENERAL OFFICERS

Raymond Allen Pearson, LL. D.....President
Room 104, Central Building.

Edgar Williams Stanton, LL. D.....Acting-President and Secretary
Room 117, Central Building.

Herman Knapp, B. S. A.....Treasurer and Registrar
Room 122, Central Building.

Orange Howard Cessna, D. D.....Chaplain
Room 212, Central Building.

Thomas Sloss.....Superintendent of Buildings and Grounds
Superintendent's Office.

Charles G. Tilden, M. D.....Physician and Sanitary Officer
Hospital Building.

Mrs. Emily Cunningham.....Advisor to Women
Margaret Hall.

Vera Morlan Dixon, B. S.....Assistant Librarian
Room 107½, Central Building.

George Platt Bowdish.....Assistant Purchasing Agent
Room 124, Central Building.

Carl Henry Schemann, B. S. in C. E.....Assistant to the President
Room 104, Central Building.

Charles Sabin Nichols, C. E.....Assistant to the Dean of Engineering
Room 315, Engineering Hall.

Minnie R. Rice.....Assistant Registrar
Room 122, Central Building.

Clarence E. Brashear, B. S. in Agr...Assistant to the Dean of Agriculture
Room 124, Hall of Agriculture.

Pierce B. Pontius.....Assistant to the Dean of Veterinary Medicine
Room 107 Veterinary Building.

### DEANS AND VICE DEANS

Edgar Williams Stanton, LL. D.....Dean of the Junior College
Room 114, Central Building.

Charles Franklin Curtiss, D. S.....Dean of the Division of Agriculture
Room 124, Hall of Agriculture.

*Anson Marston, C. E.....Dean of the Division of Engineering

Samuel Walker Beyer, Ph. D.....Dean of the Division of Engineering
Room 315, Engineering Hall.

Charles Henry Stange, D. V. M.....Dean of the Division of Veterinary
Room 107, Veterinary Building. Medicine

Robert Earle Buchanan, Ph. D..Dean of the Division of Industrial Science
Room 101, Science Building.

Catherine J. MacKay.....Dean of the Division of Home Economics
Room 106, Home Economics Building.

Spencer Ambrose Beach, M. S...Vice Dean of the Division of Agriculture
Room 201, Hall of Agriculture.

Maria M. Roberts, B. L.....Vice Dean of the Junior College
Room 218, Central Building.

*Harold Edwin Bemis, D. V. M.....Vice Dean of the Division of
Room 108, Veterinary Building. Veterinary Medicine

### AGRICULTURAL EXPERIMENT STATION

Charles Franklin Curtiss, D. S.....Director
Room 124, Hall of Agriculture.

William Henry Stevenson, B. S. A.....Vice Director
Room 25, Hall of Agriculture.

### ENGINEERING EXPERIMENT STATION

*Anson Marston, C. E.....Director

Samuel Walker Beyer, Ph. D.....Acting Director
Room 315, Engineering Hall.

Charles Sabin Nichols, C. E.....Assistant to the Director
Room 315, Engineering Hall.

* On leave of absence for Military Service.

## FACULTY COMMITTEES

Note: The star denotes that committee has coöperating student members.

*Advanced Standings and Substitutions.*—Professor Knapp, chairman; Professors Ford, MacDonald, Martin, and department heads concerned.

*Appointments.*—Professor Wilson, chairman; Professors MacKay, Meeker, Roberts.

*Catalogue Editing.*—Professor Bergman, chairman; Professors Beach, Fish, MacDonald, MacKay, Martin; Associate Member, Miss Tompkins.

*Course of Study.*—Dean Stanton, chairman; Professors Beach, Bemis, Buchanan, Cleghorn, MacKay, Marston, Pew.

*Dates of Events.*—Professor Fish, chairman; Professors Emily Cunningham, Raymond, Schmidt, Shattuck, Williams; Associate Members, Mr. Hansen, Mr. Schemann.

*Efficiency of Equipment.*—Professor Knapp, chairman: Professors Munger, Norman.

*Entrance Requirements and Secondary School Relations.*—Professor Knapp, chairman; Professors Bemis, Fisher, Hodson, Shearer, Snedecor, Wilson.

*Fraternities.*—Dean Buchanan, chairman; Professors Coover, Fish, Meeker, Pew, Stanton.

*Graduate Study.*—The President, chairman; Professors Stevenson, Beyer, Chaney, Dimock, Mackay, Pammel.

*Grounds and Buildings.**—The President, chairman; Professors Culley, Curtiss, Marston, Pammel, Stange, Stanton; Associate Members, Messrs. Erwin, T. H. MacDonald, Sloss.

*Lectures.*—Professor Noble, chairman; Professors Brown, Bartholomew, Fisher.

*Library.*—Dean Curtiss, chairman; Professors Brandt, Buchanan, Hodson, Kimball, Lloyd-Jones, Murphey, Raymond; Associate Member, Miss Dixon.

*Literary Societies*—(Including Forensics).—Professor Schmidt, chairman; Professors Brindley, Noble.

*Moral Welfare.**—Professor Cessna, chairman; Professors Emily Cunningham, Hughes, King, Wilkinson; Associate Member, Mr. Hansen.

*Publicity.**—Professor Beckman, chairman; Professors Colburn, Knapp, Shearer, Turpin; Associate Members, Messrs. Jones, Nichols, Parry.

*Public Health.**—Dr. Tilden, chairman; Professors Bergman, Brown, Hammer, Kimball; Associate Member, Mr. Levine.

*Public Safety.**—Professor Meeker, chairman; Professors Coover, Dimock, King, Mortensen; Associate Member, Mr. Wagner.

*Public Service.**—Professor Brindley, chairman; Professors Morbeck, Murphey, Norman, Pew, Wright.

*Rules*—Professor Spinney, chairman; Professors Bartholomew, Hammer, Hughes, Lincoln, Murray, Test.

*Scholarship.*—Dean Stanton, chairman; Professors Gettemy, Hechler, Meeker, Noble, Roberts.

*Student Accommodations.*—Professor Costelloe, chairman; Professors Lloyd-Jones, Fowler, Guthrie, Stiles; Associate Members, Messrs. Hansen, Schemann.

*Student Social Life.*—Mrs. Cunningham, chairman; Professors Buchanan, Fish, Roberts, Fisher, Stevenson.

*Thesis.*—Professor Pammel, chairman; Professors Ford, Major, Stevenson.

*Tuition Scholarships.*—Professor Briggs, chairman; Professors Ferrin, Crum.

### COUNCILS

Note: The star denotes that council has coöperating student members.

*Athletic Council.**—The President, chairman; Professor Knapp, treasurer; Professor Williams, secretary; Professors Beyer, Coover, Curtiss; one member each from the Senior, Junior, Sophomore, and Freshman classes.

*Music Council.**—The President, chairman; Professor Knapp, treasurer; Professor Bemis, secretary; Professors Bailey, MacKay, Schmidt; one member each from the Senior and Junior classes

*Summer Session Council*—The President, chairman; Deans of Divisions which give work, and the Director of the Summer Session.

### AFFILIATED COMMITTEE

*Women's Housing Committee.*—Mrs. Stanton, chairman; Mrs. Cunningham, Miss MacKay, Mrs. Marston, Miss Roberts.

# Collegiate Work

## *Officers of Instruction

### President and Deans

Raymond Allen Pearson. 1912.....President
B. S. in Agr., Cornell University, 1894; M. S. in Agr., 1899; LL. D., Alfred University, 1909; D. of Agr., University of Nebraska, 1917.

Edgar Williams Stanton. **1877, 1873.....Acting-President, Dean of the Junior College, Professor of Mathematics
B. Sc., Iowa State College, 1872; M. Sc., 1887; LL. D., Coe College, 1904.

Charles Franklin Curtiss. 1897, 1891.....Dean of the Division of Agriculture, Director of Experiment Station
B. S. A., Iowa State College, 1887; M. S. A., 1892; D. S. in Agriculture, Michigan Agricultural College, 1907.

***Anson Marston. 1892..Dean of the Division of Engineering, Professor of Civil Engineering
C. E., Cornell University, 1889.

Samuel Walker Beyer. 1898, 1897...Dean of the Division of Engineering; Acting Director, Engineering Experiment Station; Professor of Mining Engineering and Geology
B. S., Iowa State College, 1889.
Ph. D, Johns Hopkins Univ., 1895.

Charles Henry Stange. 1909, 1907.....Dean of the Division of Veterinary Medicine, Professor of Veterinary Theory and Practice
D. V. M., Iowa State College, 1907.

Robert Earle Buchanan. 1909, 1904.....Dean of the Division of Industrial Science, Professor of Bacteriology
B. S., Iowa State College, 1904; M. S., 1906; Ph. D., University of Chicago, 1908.

Catharine J. MacKay. 1911, 1910.....Dean of the Division of Home Economics, Professor of Home Economics
Diploma, Drexel Institute, 1907; Boston Cooking School, 1907; Teachers' College, Columbia University, 1910, 1914.

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* The collegiate faculty consists of the President, Deans, Registrar, all Professors and Associate Professors doing collegiate work, Librarian, Advisor to Women, Director of Agricultural Extension Work, and Director of Engineering Extension Work.

** First date after the name indicates date of appointment to professional position; the second date, when the first fails to do so, indicates the date of first appointment in the College.

*** On leave of absence for Military Service.

## Professors

***T. R. Agg. 1915, 1913.....Professor of Highway Engineering
B. S. in E. E., Iowa State College, 1905; C. E., 1914.

Frederick William Beckman. 1911..Professor of Agricultural Journalism
Ph. B., University of Iowa, 1897.

Spencer Ambrose Beach. 1905.....Vice Dean of the Division of Agriculture, Professor of Horticulture
B. S. A., Iowa State College, 1887; M. S., 1892.

***Harold Edward Bemis. 1915, 1908....Vice Dean of the Division of Veterinary Medicine, Professor of Veterinary Surgery
D. V. M., Iowa State College, 1908.

*Alfred Allen Bennett. 1885.....Professor of Chemistry
B. Sc., University of Michigan, 1877; M. Sc., Iowa State College, 1888.

Henry Dale Bergman. 1916, 1910.....Professor of Physiology and Pharmacology
D. V. M., Iowa State College, 1910.

Harry Artley Bittenbender. 1917, 1910..Professor of Poultry Husbandry
B. S. in A. H., Iowa State College, 1911.

Ralph Kenneth Bliss. 1914.....Director of Agricultural Extension
B. S. A., Iowa State College, 1905.

**Fletcher Briggs. 1909.....Professor of Modern Languages
Ph B., University of Iowa, 1901; M. A., 1902.

John Edwin Brindley. 1913, 1907.....Professor of Economics
B. L., University of Wisconsin, 1902; A. M., 1906; Ph. D., University of Iowa, 1911.

Percy Edgar Brown. 1914, 1910.....Professor of Soil Bacteriology
B. Sc., Rutgers College, 1906; A. M., 1909; Ph. D., 1912.

Orange Howard Cessna. 1900.....Professor of History and Psychology
B. S., Iowa State College, 1872; B. D., Garrett Biblical Institute, 1885; D. D., 1900; A. M., Cornell College, 1901.

Winfred Forrest Coover. 1913, 1904..... ....Professor of Chemistry
A. B., Otterbein University, 1900; A. M., Ohio State University, 1903.

****Martin Francis Paul Costelloe. 1916, 1911..Professor of Agricultural Engineering
B. S. in C. E., University of Nebraska, 1906; A. E., 1916.

William Wallace Dimock. 1911, 1909.....Professor of Veterinary Pathology and Bacteriology
B. Agr., Connecticut Agricultural College, 1901; D. V. M., Cornell University, 1905; D. V. M., University of Habana, 1907.

Fred Alan Fish. 1907, 1905.....Professor of Electrical Engineering
M. E. in E. E., Ohio State University, 1898.

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* Absent on leave.
** Absent on leave during the spring semester 1918.
*** On leave of absence for Military Service.
**** Deceased January 12, 1918.

Joseph Edward Guthrie. 1917, 1901.....Professor of Zoology
B. S., University of Minnesota, 1900; M. S., 1901

Bernard Wernick Hammer. 1916, 1911...Professor of Dairy Bacteriology
B. S. A., University of Wisconsin, 1908.

Harold De Mott Hughes. 1910.....Professor of Farm Crops
B. S., University of Illinois, 1907; M. S. A., Univ. of Missouri, 1908.

Allen Holmes Kimball. 1915, 1914. Professor of Architectural Engineering
B. L., University of California, 1910; B. S., Massachusetts Institute of Technology, 1911; M. S., 1912.

Everett Edgar King. 1913, 1911.....Professor of Railway Engineering
B. S., Rose Polytechnic Institute, 1901; C. E., 1908; M. S., 1909; A. B., Indiana University, 1910; M. C. E., Cornell University, 1911.

John Edward Kirkham. 1913, 1907...Professor of Structural Engineering
B. S. in C. E., University of Missouri, 1895.

~~Herman Knapp. 1887, 1883.....~~Registrar
B. S. A., Iowa State College, 1883.

General James Rush Lincoln. 1884, 1883....Professor of Military Science
Brigadier General, U. S. Vol., 1898-1899.

Gilmour Beyers MacDonald. 1913, 1910.....Professor of Forestry
B. S. F., University of Nebraska, 1907; M. F., 1914.

John Nathan Martin. 1917, 1911.....Professor of Plant Pathology
A. B., Indiana University, 1907; Ph. D., University of Chicago, 1913.

Warren H. Meeker. 1907, 1891.....Professor of Mechanical Engineering
M. E., Cornell University, 1891.

Irving E. Melhus. 1917, 1916.....Professor of Plant Pathology
B. Sc. Iowa State College, 1906; Ph. D., University of Wisconsin, 1911.

Ethelwyn Miller. 1917.....Professor of Domestic Art
A. B., Franklin College, 1894; B. S., Columbia University, 1906.

Martin Mortensen. 1909.....Professor of Dairying
B. S. A., Iowa State College, 1909.

Harlan Bruce Munger. 1914.....Professor of Farm Management
B. S., Cornell University, 1912.

Howard Sylvester Murphey. 1913, 1909.....Professor of Veterinary
D. V. M., Ohio State University, 1908. Anatomy and Histology

Alvin Buell Noble. 1898.....Professor of English
B. Ph., State University of Iowa, 1887.

Louis Hermann Pammel. 1889.....Professor of Botany
B. Agr., University of Wisconsin, 1885; M. S., 1889; Ph. D., Washington University, St. Louis, 1898.

William Harper Pew. 1912, 1909.....Professor of Animal Husbandry
B. S. A., Iowa State College, 1907.

Maria M. Roberts. 1913, 1891..Vice Dean of the Junior College, Professor
B. L., Iowa State College, 1890. of Mathematics

Fredrica Von Trice Shattuck. 1916, 1907....Professor of Public Speaking
B. A., University of Wisconsin, 1905.

Kenneth G. Smith. 1913.....Professor of Engineering Extension
A. B., Univ. of Chicago, 1896; B. S. in M. E., Univ. of Illinois, 1905.

Louis Bevier Spinney. 1897, 1891..... .....Professor of Physics
B. M. E., Iowa State College, 1892; B. S. (E. E.), 1893.

Homer Francis Staley. 1916, 1914.....Professor of Ceramic Engineering
B. A., Ohio State University, 1904.

William Henry Stevenson. 1903, 1902.....Professor of Farm Crops and Soils; Vice Director of Experiment Station
A. B., Illinois College, 1893; B. S. A., Iowa State College, 1905.

*Henry Elijah Summers. 1898.. .. . .... ..... Professor of Zoology
B. S., Cornell University, 1886.

Henry William Vaughan 1917, 1913.....Professor of Animal Husbandry
B. Sc. in Ag., Ohio State University, 1908; M. Sc., 1909.

Samuel Clyde Williams, 1913, 1907.....Professor of Physical Training
B. S, University of Iowa, 1901; D. D. S., 1903.

**Guy Mitchell Wilson, 1913.....Professor of Agricultural Education
A. B., Indiana Univ., 1900; M. A., 1908; Ph. D., Columbia Univ., 1918.

Honorable James Wilson. 1913, 1891...Emeritus Professor of Agriculture
M. S. A., Iowa State College, 1907; D. S, 1914; LL. D., University of Wisconsin, 1904; LL. D., University of Edinburgh, 1913.

### Associate Professors

Archibold A. Bailey. 1917, 1916..... ..Associate Professor of Music

Arthur Lawrence Bakke 1917, 1910. ...Associate Professor of Botany
B. S., I. S. C, 1909; M. S., 1911; Ph. D, Univ. of Chicago, 1917.

Ross Leon Bancroft. 1917, 1915..... ....Associate Professor of Soils
B. S., University of Wyoming, 1914; M. S., Iowa State College, 1915.

Harold Criswell Bartholomew. 1912, 1911.....Associate Professor of Electrical Engineering
M. E., in E. E., Ohio State University, 1906.

James Cloyd Bowman. 1914, 1910.....Associate Professor of English
B. S., Ohio Northern University, 1905; B. Litt., 1908; A. M., Harvard University, 1910.

Iva L. Brandt. 1914, 1912.....Associate Professor of Domestic Art
B. S. in H. Ec., Iowa State College, 1905.

Charles Byrne. 1917..... ...Associate Professor of Military Science
Lieutenant Colonel, U. S. A.

George Arthur Chaney. 1914, 1913...Associate Professor of Mathematics
M. S., Highland Park College, 1906; M. A., Univ. of Wisconsin, 1910. Sc. D., Highland Park College, 1917.

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* Absent on leave.
** Absent on leave during the fall semester 1917.

Mark Perkins Cleghorn. 1908, 1902...Associate Professor of Mechanical
B. S. in E. E., Iowa State College, 1902; M. E., 1907. Engineering

Frederick Erving Colburn. 1915, 1907—Associate Professor of Photography

Julia Trueman Colpitts. 1913, 1900..Associate Professor of Mathematics
A. B., Mount Allison Univ., Canada, 1899; A. M., Cornell Univ., 1900.

Roy Winchester Crum. 1914, 1907...Associate Professor of Experimental
B. C. E., Iowa State College, 1907; C. E., 1914. Engineering

Frank Hamilton Culley. 1915, 1914....Associate Professor of Landscape
B. Sc., Massachusetts Agricultural College, 1913; Gardening
M. L. A., Harvard University, 1914.

John S. Dodds. 1917.....Associate Professor of Highway Engineering
B. S. in C. E., Iowa State College, 1912; C. E., 1917.

Eric Eyre Eastman. 1917, 1913.....Associate Professor of Soils
B. S., Iowa State College, 1913; M. S., 1915.

J. M. Evvard. 1916, 1910.....Associate Professor of Animal Husbandry
B. S. A., Univ. of Illinois, 1907; M. S. A., Univ. of Missouri, 1909.

Henry Ellsworth Ewing. 1916, 1909..Associate Professor of Entomology
B. A., Univ. of Illinois, 1906; M. A., 1908; Ph. D., Cornell Univ., 1911.

Evan F. Ferrin. 1913, 1911...Associate Professor of Animal Husbandry
B. S. in A. H., Iowa State College, 1911.

Genevieve Fisher. 1916, 1914 .....Associate Professor of Agricultural
B. S., Teachers' College, Columbia University, 1914. Education

*Howard Carlton Ford. 1911, 1907..Associate Professor of Surveying and
B. S. (C. E.), Colorado, 1904; M. S., 1905; C. E., 1907. Astronomy

Chester Charles Fowler. 1913, 1909....Associate Professor of Chemistry
B. S. in Chem. Engr., University of Illinois, 1909; M. S., 1913; Ph. D.,
Jefferson Medical College, 1915.

Winifred Sarah Gettemy. 1914, 1911..Associate Professor of Domestic Art

Lester S. Gillette. 1917, 1914....Associate Professor of Dairy Husbandry
B. S. in A. H., I. S. C., 1913; A. M., Univ. of Missouri, 1914.

Frank M. Harrington. 1916, 1913....Associate Professor of Horticulture
B. S., Oregon Agricultural College, 1913.

William Roy Hechler. 1914, 1911....Associate Professor of Farm Crops
B. S. A., University of Missouri, 1911.

Laurence C. Hodson. 1907, 1906..Assoc. Professor of Mining Engineering
B. C. E., Iowa State College, 1899; E. M., Mich. College of Mines, 1901

Kenneth Cole Ikeler. 1915....Associate Professor of Animal Husbandry
M. E., Pennsylvania Normal, 1909; B. S., Pennsylvania State College,
1913; M. S., Iowa State College, 1914.

William Kunerth. 1916, 1907.....Associate Professor of Physics
M. A., University of Wisconsin, 1910.

Richard A. Leavell 1915, 1914.....Associate Professor of Mechanical
B. S. in M. E., Armour Institute, 1910. Engineering

* On leave of absence for Military Service.

Orson G. Lloyd. 1913, 1912....Associate Professor of Farm Management
B. S., Utah Agricultural College, 1910; M. S., Univ. of Wisconsin, 1912.

Orren Lloyd-Jones. 1914, 1913..Associate Professor of Animal Husbandry
B. S., University of Wisconsin, 1908; M. S., 1911; Ph. D., 1913.

Clyde McKee. 1916, 1913.....Associate Professor of Farm Crops
B. S. in Agr., Kansas State Agricultural College, 1910.

Charles Curtis Major. 1908..Assoc. Professor of Mechanical Engineering
M. E., Bloom's State Normal School, Pa., 1891; M. E., Cornell University, 1898.

Charles August Mann. 1916.....Associate Professor of Chemical Engr.
B. S., University of Wisconsin, 1909; M. S., 1911; Ph. D., 1915.

Charles William Mayser. 1915..Associate Professor of Physical Training

Ernest Muchmore Mervine. 1915, 1912....Associate Professor of Agri-
M. E., University of Lehigh, 1909. cultural Engineering

Helen Monsch. 1915.....Associate Professor of Domestic Science
B. S., Kansas Agricultural College, 1904; B. S., University of Chicago, 1909; A. M., Columbia University, 1916.

George Chester Morbeck. 1914, 1912....Associate Professor of Forestry
B. S. in Forestry, Michigan Agricultural College, 1904; M. F., 1915.

Charles Sabin Nichols. 1917, 1910.....Associate Professor of Civil
B. C. E., Iowa State College, 1909; C. E., 1914. Engineering

Roy A. Norman. 1911, 1907.....Associate Professor of Mechanical
B. M. E., Iowa State College, 1903; M. E., 1909. Engineering

Ernest Alanson Pattengill. 1914, 1900..Assoc. Professor of Mathematics
B. S., Iowa State College, 1897; B. S., Cornell University, 1899.

Ralph S. Potter. 1916, 1913.....Associate Professor of Soils
A. B., Lake Forest College, 1909; M. S., University of Illinois, 1911; Ph. D., 1913.

John Owen Rankin. 1916.....Associate Professor of Agricultural
A. B., Tarkio College, 1904; B. S. A., I. S. C., 1908; Economics
M. A., George Washington University, 1912.

*William Randolph Raymond. 1912, 1907.....Associate Professor of
A. B., Grinnell College, 1894. English

Raemer R. Renshaw. 1914, 1913..Assoc. Professor of Organic Chemistry
B. S., University of Oregon, 1902; M. S., 1903; Ph. D., Columbia University, 1907.

Charles Dobbs Rice. 1917, 1913.....Associate Professor of Veterinary Pathology and Bacteriology
B. S., Georgetown College, 1902; D. V. M., Iowa State College, 1913.

Arthur William Rudnick. 1916, 1913..Associate Professor of Dairying
B. S., Iowa State College, 1910.

* On leave of absence for Military Service.

Louis Bernard Schmidt. 1911, 1906.....Associate Professor of History
Ph. B., Cornell College, 1901; A. M., 1906.

William Elmer Sealock. 1915.....Associate Professor of Agricultural
A. B., University of Ohio, 1905. Education

Phineas Stevens Shearer. 1914, 1912.....Associate Professor of Animal
B. S. in A. H., Iowa State College, 1912. Husbandry

Roy Eugene Smith. 1914, 1909.....Associate Professor of Soils
B. S. A., Iowa State College, 1909; M. S., 1911.

George Waddel Snedecor. 1914, 1913..Associate Professor of Mathematics
B. S., Univ. of Alabama, 1905; M. A., Univ. of Michigan, 1912.

Harold Stiles. 1915, 1914.....Associate Professor of Physics
A. B., Kenyon College, 1896; A. M., Harvard University, 1904; Ph. D., Northwestern University, 1909.

Louis Agassiz Test. 1914, 1913.....Associate Professor of Chemistry
B. M. E., Purdue Univ., 1894; A. C., 1896; Ph. D., Univ. of Chicago, 1907.

George Ellsworth Thompson. 1915, 1914...Associate Professor of Physics
A. B., Indiana Univ., 1909; A. M., 1910; Ph. D., Cornell Univ., 1913.

Winifred R. Tilden. 1917 1904..Associate Professor of Physical Culture
B. A. Mt. Holyoke College, 1903.

Thomas Franklin Vance. 1916, 1914—Associate Professor of Psychology
A. B., Coe College, 1909; M. A., University of Iowa, 1911; Ph. D., 1913.

George Henry Von Tungeln. 1914, 1913—Assoc. Prof. of Rural Sociology
Ph. B., Central Wesleyan College, 1909; M. A., Northwestern University, 1910.

*John Anderson Wilkinson. 1914, 1913..Associate Professor of Physical Chemistry and Inorganic Analysis
B. Sc., Ohio State University, 1903; Ph. D., Cornell University, 1909.

Charles A. Wright. 1915...Associate Professor of Electrical Engineering
B. E., Tulane University, 1906; E. E., 1909; M. E. E., Harvard University, 1910.

**Assistant Professors**

John Hampton Atkinson. 1914.....English
Ph. B., Ohio University, 1897; A. M., Columbia University, 1901.

Francis Marsh Baldwin. 1917.....Zoology
A. B., Clark College, 1906; A. M., 1907; Ph. D., University of Illinois, 1917.

John Thaxter Bates. 1910, 1907.....Mechanical Engineering
B. S. in M. E., University of Maine, 1907.

Charles Alton Baughman. 1917, 1908.....Civil Engineering
B. S. in C. E., Iowa State College, 1915; C. E., 1916.

* On leave of absence for Military Service.

Rudolph Ray Bolton. 1914.....Veterinary Practice and Diagnosis
A. B., Ohio University, 1909; D V. M., Cornell University, 1912.

Frank Emerson Brown. 1917.....Chemistry
A. B., Kansas State Normal School, 1911; S. B University of Chicago, 1913.

***John Hall Buchanan. 1915, 1911.....Chemistry
B. S., Iowa State College, 1911; M. S., 1915.

Ollison Craig. 1915.....Mechanical Engineering
B. S. in M. E., University of Illinois, 1909.

**Louis De Vries. 1916, 1913.....Modern Languages
A. B., Central Wesleyan College, 1907; A. M., Northwestern University, 1908.

Vera Morlan Dixon. 1916.....Library
B. S., Iowa State College, 1908.

Charles S. Dorchester. 1916, 1913.....Farm Crops
B. S. in Agron, Iowa State College, 1913.

Annie Wilson Fleming. 1915, 1900.....Mathematics
B. S., Iowa State College, 1894.

Sidney Longman Galpin. 1913.....Geology
A. B., Western Reserve University, 1907; A. M., Cornell University, 1910; Ph. D., 1912.

Heber Howard Gibson. 1915.....Agricultural Education
A. B., Denison University, 1909; M. A., Columbia University, 1912.

LeRoy Bethuel Greenfield. 1914.....English
B. A., Univ. of Oklahoma, 1903; Ph. M., Univ. of Chicago, 1906.

James Daniels Grossman. 1917 1914..Veterinary Anatomy and Histology
G. Ph. Ohio Medical College, 1911; D. V. M., Ohio State University, 1914.

***Willard F. Guard. 1916, 1914.....Veterinary Surgery and Obstetrics
D. V. M., Ohio State University, 1912.

Bruce Magill Harrison. 1913, 1910.....Zoology
B. S., Ottawa University, 1905; M. S., University of Illinois, 1908.

Arthur John Hauser. 1916, 1913.....Dairying
B. S. in Agr., Pennsylvania State College, 1911.

John Hug. 1913, 1909.....Mechanical Engineering
B. M. E., Iowa State College, 1909.

Jesse Greenleaf Hummel. 1910, 1903.....Mechanical Engineering
B. M. E., Iowa State College, 1902; M. E., 1914.

Jane Agnes Humphrey. 1915.....Home Economics

*Harlan Woodbridge Johnson 1917, 1915.....Soils
B. S., Iowa State College, 1914; M. S., 1915.

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* On leave of absence
** Absent on leave during the fall semester 1917
*** On leave of absence for Military Service.

James Byron Kelley. 1917, 1912.....Agricultural Engineering
B. S. in M. E., Iowa State College, 1912; B. S. in A. E., 1913.

*Max Levine. 1914, 1913.....Bacteriology and Hygiene
B. Sc., Massachusetts Institute of Technology, 1912.

Wylle B. McNeal. 1916, 1915.....Home Economics
B. S. in Ed., University of Chicago, 1915.

Ned A. Merriam. 1913.....Physical Training

Frank Eric Millen. 1917.....Apiculture
B. Sc. A., Ontario Agricultural College and Toronto University, 1913.

*Nelson Louis Nelson. 1915, 1911.....Veterinary Practice and Diagnosis
D. V. M., Iowa State College, 1911.

Harry Russell O'Brien. 1915.....Agricultural Journalism
B. A., Ohio State University, 1910; M. A., 1912.

Ruth O'Brien. 1917. 1916.....Chemistry
B. S., University of Nebraska, 1914; M. A., 1915.

Anna Margrethe Olsen, 1916, 1915.....Home Economics
B. Sc., Columbia University, Teachers' College, 1912.

Oscar Anton Olson. 1915, 1913.....Mechanical Engineering
B. M. E., Iowa State College, 1908; M. E., Iowa State College, 1914.

Frank D. Paine. 1913, 1912.....Electrical Engineering
B. S. in E. E., Iowa State College, 1909.

A. Marcus Peisch. 1917.....Economic Science
A. B., University of Wisconsin, 1915.

Herbert John Plagge. 1913, 1909.....Physics
B. S., Northwestern Univ., 1906; M. A. Univ. of Wisconsin, 1910.

Frank Anson Robbins. 1912, 1910.....Electrical Engineering
A. B., Yankton College, 1907; B. S., University of Illinois, 1910.

Raymond Willard Rogers. 1915.....Physical Training
B. P. E., Springfield College, 1910.

Everett Henry Rucker. 1917.....Poultry Husbandry
B. S. A., University of Missouri, 1915; A. M., 1916.

*Charles F. Salt. 1917, 1915.....Agricultural Journalism
B. S., in Agr., Ohio State University, 1914; B. A., 1915.

Herman A. Scullen. 1914.....Zoology
A. B., University of Oregon, 1910.

John Eliphalet Smith. 1917.....Geology
B. S., Oregon Agricultural College, 1902; M. S., Iowa State College, 1911.

Anna Helen Tappan. 1917, 1914.....Mathematics
A. B., Western College, 1909; A. M., Cornell University, 1912; Ph. D., Cornell University, 1914.

* On leave of absence for Military Service.

Arthur S. Thurston. 1916.....Horticulture
B. Sc., Massachusetts Agricultural College, 1914; M. Sc., 1916.

Dora Gilbert Tompkins. 1908, 1905.....English
A. B., Monmouth College, 1893; A. M., Knox College, 1898.

Thomas Roy Traux. 1915, 1913.....Forestry
B. S., Iowa State College, 1912.

Harter Walter. 1914.....Physical Training
A. B., Wabash College, 1909.

Polly Witwer. 1916.....Home Economics
B. S. in H. Ec., Iowa State College, 1912; A. M., Columbia University, 1916.

## Instructors

Homer George Anderson, B. S.....Physics, 1914
**Raymond Arthur Anderson, Ph. B.....English, 1916
**Alexander Vasey Arragon, A. B., A. M.....History, 1915
Hazel Baker, B. S.....Domestic Art, 1917, 1916
Elza Gordon Bassett, A. B.....Modern Language, 1913
Bertha A. Bennett.....Physical Culture, 1917
Louis Jacob Bircher, A. B., B. S. in Ag. Ed.....Chemistry, 1916
Alma B. Booth.....Home Economics, 1913
Mrs. Ruth Edgerton Brooks, B. Sc. in Phys. Ed....Physical Culture, 1914
John James Brunner.....Dairying, 1916
*Helen Alice Burling, B. S., M. S.....Bacteriology, 1913
James William Cameron.....Mechanical Engineering, 1907
**William Glasgow Bruce Carson, A. B., A. M.....English, 1916
Dean G. Carter, B. S. in A. E.....Agricultural Engineering, 1916
Janet Grace Cation, Ph. B.....Home Economics, 1916
Steward Chandler, Ph. B.....Modern Language, 1916
Harold Farnsworth Childs, M. A.....English
Vivian Leroy Chrisler, A. B., B. S., M. A.....Physics, 1916
Clarissa May Clark, B. Sc.....Bacteriology, 1917
Harold F. Clemmer, B. C. E.....Civil Engineering, 1914
Florence Lathrop Coolidge, A. B., M. A.....English, 1916
Marian Elizabeth Daniells, A. B.....Mathematics, 1914
Ethelwyn Mae Dodson, B. S.....Domestic Art, 1917
Lawrence Wood Durrell, B. S., M. S.....Plant Pathology, 1917, 1915
J. Lawrence Eason, A. B., A. M.....English, 1915
George V. Emery, B. A.....Physics, 1914
Honora English, B. S.....Domestic Art, 1916
Mrs. Mary Peters Fairfield, B. A.....Modern Language, 1908
Fay Farnum, B. S., M. A.....Mathematics, 1915

*Absent on leave.
** On leave of absence for Military Service.

L. Ruth French, B. S.....Library Serial Cataloguer, 1917
Elizabeth Genevieve Fuller, A. B.....English, 1916
Minnie D. Harmsen, B. Pe., B. S.....Mathematics, 1917
Berthold Francis Hastings, Ph. B., Mn. E....Structural Engineering, 1917
Ada Hayden, B. S., M. S.....Botany, 1910
Anson Hayes, B. S., M. S.....Chemistry, 1915
Maurice D. Helser, B. S. A., M. S. in A. H.....Animal Husbandry, 1916
Anna M. Henderson .....Home Economics, 1916
Henry F. Hertz.....Agricultural Engineering, 1915
Otto A. Herzog, A. B., A. M.....Modern Language, 1915
Blanche Hilliker.....Home Economics, 1917
Roy J. Holmes, Ph. B.....English, 1916
Frederick Franklin Householder, B. A. M. A.....Physics, 1914
George William Hulbert, A. B.....Public Speaking, 1917
Blanche Ingersoll, B. S.....Home Economics, 1915
Palma Iverson, B. A.....Mathematics, 1916
George Judisch.....Veterinary Pharmacology, 1912, 1901
Delta May Kauffman, A. B.....Public Speaking, 1916
Rosemond Harriet Kedzie, B. S.....Home Economics, 1913
Thomas O. Kellems, B. S.....Chemistry, 1915
Raymond Eller Kirk, B. Sc., M. S.....Chemistry, 1916
G. E. Linden.....Physical Training, 1914
Ingeborg G. Lommen, M. L.....Modern Language, 1907
Jessie McArthur, B. A., M. A.....English, 1914
Daniel McKay, Jr., B. S. in Hort.....Horticulture, 1916
Elizabeth McKim, B. S.....Mathematics, 1913
Samuel H. McNutt, D. V. M. Veterinary Pathology and Bacteriology.. 1917
Forby Kenneth Merkley, B. S. A.....Dairying, 1917
Charles Miller, B. Sc.....Agricultural Engineering, 1913
Cora B. Miller, B. S.....Home Economics, 1916
Rodney D. Miller, B. Sc.....Poultry Husbandry, 1917
Nellie M. Naylor, B. A.....Chemistry, 1909
Alois F. Nickels.....Mechanical Engineering, 1911
Grace Isabel Norton, B. A.....Modern Language, 1901
Edith Palmer.....Domestic Art, 1917
Jean Peterson.....Physical Culture, 1917
Everett Andrew Piester, B. S.....Landscape Gardening, 1917
Roy Arden Pochel, B. S.....Civil Engineering, 1917
Ezra Cornelius Potter.....Mechanical Engineering, 1898
Betty Huston Pritchett, A. B.....Library Cataloguer, 1915, 1912
Robina Rae.....Agricultural Librarian, 1909
Mrs. Lola Stephens Rice, B. S.....Chemistry, 1905
Reuben Charles Riedesel, B. M. E.....Mechnical Engineering, 1912
Mary Gladys Rush, B. S.....Desk Librarian, 1917
Ruth Bogardus Safford, B. L.....English, 1908
James R. Sage, Jr., A. B., M. S.....Mathematics, 1915
Lewis Ralph Sanders.....Dairy, 1916

John A. Sawin.....Mechanical Engineering, 1907
Mary Schwartz.....Music, 1917
Dwight L. Scoles, B. S.....Chemistry, 1915
Frank F. Sherwood, A. B., A. M.....Chemistry, 1917
Helen Florence Smith, A. B.....Mathematics, 1907
Ruth McNary Smith, B. S.....Home Economics, 1917
Edward Merritt Spangler.....Mechanical Engineering, 1905, 1904
Harold Greene Sprague B. S. in Arch....Architectural Engineering, 1915
Arward Starbuck, A. B.....English, 1913
Benjamin Paul Stonecifer B. S.....Horticulture, 1917
Lillian Boynton Storms, B. S.....Chemistry, 1917
*Laura May Taggart, B. S.....Chemistry, 1907, 1906
Cecile Van Steenberg, Ph. B.....Household Arts, 1917
Donald Parker Weeks, Jr., B. Sc. in A. E.....Agr'l Engineering, 1916
Herbert Ralph Werner, Ph. B., Ph. M., A. M.....Zoology, 1914
Maurice H. Weseen, A. B., M. A.....English, 1914
**Franklin Scott Wilkins, B. S., M. S.....Farm Crops, 1914
Amy Winslow, A. B., B. L. S.....Reference Librarian, 1917
Alexander John Wuertz, A. B., M. A.....Chemistry, 1917
Robert Wylie, B. S. in Agr., A. M.....Dairy Husbandry, 1916
Lawson Edwin Yocum, B. S.....Botany, 1916
Zelma Zentmire, B. S., M. S.....Chemistry, 1917, 1911

## Assistants

Ruby Corene Aldrich.....Engineering Library, 1917
Chester W. Anderson, B. S.....Chemistry, 1917
Sarah Elizabeth Baily, B. A.....Library, 1917
Russell S. Banks, A. B., M. S.....Chemistry, 1917
Lora Eleanor Bolton, A. B.....Library, Assistant Cataloguer, 1917
Ralph Emmet Brewer, A. B.....Chemistry, 1917
Ruth Bechtel Cessna, B. S., M. A.....Chemistry, 1917
Oliver Wendall Chapman, B. A.....Chemistry, 1917
T. D. Collins.....Band Leader, 1917
J. G. Hanmer.....Farm Superintendent, 1914
Albert Hartzell, B. S., M. S.....Entomology, 1917
L. M. Kelley.....Agricultural Engineering, 1911
Thomas Seeter Leith, D. V. M.....Veterinary Anatomy, 1916
Mrs. Lea Readessell.....Music, 1917
John Reardon.....Horticulture, 1909
Ivan Lincoln Ressler, A. B.....Zoology, 1915
Marie Rees, Ph. B.....Botany, 1917
Mildred Semmons, B. S.....Library, 1917
Mrs. Grace Noll Smith, Ph. B.....Chemistry Library, 1915
Robert Smyth, B. S.....Botany, 1917
Mrs. Agnes Fleming Van Auken, A. B.....Veterinary Library, 1915

* Absent on leave.
** On leave of absence for Military Service

Earl R. Waffle, B. S.....Chemistry, 1915
M. Grace Walworth, A. B.....Library, 1917
William Craig Orr White, A. B.....Chemistry, 1917
Noel J. Williams, A. B.....Chemistry, 1917

### Fellows and Scholars

Earl Sayee Brashier, B. Sc., D. V. M.....Veterinary Anatomy, 1917
Evelyn M. Bruett, B. Sc.....Bacteriology, 1917
William A. Cordes, B. S.....Dairying, 1917
Bruce Judson Firkins, B. S.....Soils, 1917
William Lewis Harter, A. B.....Farm Management, 1917
Henry Hartman, B. S.....Horticulture, 1917
Waldo Frederick Heppe, B. S. in Ag.....Animal Husbandry, 1917
Earl A. Hewitt, A. B., B. S.....Veterinary Anatomy, 1915
William Albert Hoffman, B. S.....Zoology, 1917
Robert Stearns Kirby, B. S., M. S.....Botany, 1916
Robert Vernes McBride, B. S.....Animal Husbandry, 1917
Harry William Orr, D. V. M.....Veterinary Physiology, 1918
Paul Frederick Orr, B. S.....Bacteriology, 1917
Leo B. Sharp, B. S.....Animal Husbandry, 1917
James Henry Stallings, B. S., M. S.....Soils, 1917
Edward James Stirnman, B. S. in A. E....Agricultural Engineering, 1917
Florence Willey, B. S.....Botany, 1917

### Student Assistants

R. H. Porter.....Farm Crops
I. B. Raeder.....Soils
J. J. Wilson.....Farm Crops
Wesley Young.....Veterinary Physiology

For lists of Officers and Instructors in other lines of work maintained at the college see pages as follows:

Experiment Stations
- Agriculture, page 389
- Engineering, page 392
- Veterinary Investigation, page 395
- State Biological Laboratory, page 396

Extension Work, pages 378 and 385
Non-collegiate, page 320

# Admission to the College

Applications for credential blanks and all communications with regard to the admission of any student to the College should be addressed to the Registrar. Official high school records should be filed with the Registrar at the close of the school year, if possible, and not later than the second Monday in August or the first Monday in January. The Registrar will determine the value of all credentials and will notify the applicant of their acceptance. He will also assign the applicant for admission to his position in the course desired. This assignment will be conditioned upon the student's doing creditable work.

Applicants for admission to the freshman classes should be at least sixteen years of age and must present satisfactory evidence of having completed the preparatory studies required for admission to the course desired.

A student may enter the College at the beginning of either semester. Those wishing to enter at the beginning of the second semester should find out from the Registrar whether entrance at that time is feasible in their case. The regular classes begin with the opening in September and the student is urged to commence at that time. Some freshmen subjects are, however, taught in both semesters. The freshman work will be of such grade that the graduate of an accredited high school can reasonably be expected to carry it creditably. The responsibility of maintaining himself in the freshman class rests, however, upon the student. The College desires to emphasize the importance of thorough preparation, particularly in subjects that are to be continued in College, for example, in mathematics and English. In these subjects the College has found it helpful to conduct a review at the beginning of the year. Students who are found to be inadequately prepared are assigned to a less advanced section, or otherwise helped to make up the deficiency. Since without thorough preparation satisfactory progress is impossible, students are urged to review carefully, before entering College, algebra through quadratics and English composition and grammar. Those desiring admission should examine *Requirements for Admission* (page 27), *Methods for Obtaining the Fifteen Units* (page 30), and especially the method of study and the attainment desired in the respective subjects set forth in the revised edition of Bulletin No. 1. The Accredited High School, published by the State Board of Education, Des Moines, Iowa.

## ACCREDITED SCHOOLS

High schools and academies are placed on the accredited list upon the recommendation of the Board of Secondary School Relations, and upon the approval of the faculties of the three state educational institutions of

Iowa. The Board on Secondary School Relations was appointed by the Iowa State Board of Education.

All questions with regard to inspection of the schools or their relation to the three state institutions should be addressed to John E. Foster, Inspector, State Board of Education, Des Moines, Iowa.

## REQUIREMENTS FOR ADMISSION TO THE SEVERAL DIVISIONS OF THE COLLEGE

(For admission to Graduate Courses, see page 57)
(For requirements for Non-Collegiate Courses, see page 322)

The requirements for admission are stated in terms of units. An entrance unit is defined as thirty-six weeks of high school work in one subject of study, with five class periods per week, each not less than forty minutes in length. Each laboratory period should be at least eighty-five minutes in length. Students desiring admission to the Freshman year must present fifteen units. Of these, certain are required and the others may be elective.

### *Units Required for Admission

| | Division of Agriculture Units | Division of Engineering Units | Division of Home Economics Units | Division of Industrial Science Units | Division of Veterinary Medicine Units |
|---|---|---|---|---|---|
| Groups— | | | | | |
| 1 English | 3 | 3 | 3 | 3 | 3 |
| 2 History, Civics, Economics | 1 | 1 | 1 | 1 | 1 |
| 3 Foreign Language** | .. | .. | .. | .. | .. |
| 4 Mathematics | | | | | |
| Algebra | 1½ | 1½ | 1½ | 1½ | 1 |
| Geometry, Plane | 1 } 2½ | 1 } 3 | 1 } 2½ | 1 } 3 | 1 } 2 |
| Geometry, Solid | ... | ½ | ... | ½ | ... |
| 5 Natural Sciences | .. | .. | .. | .. | .. |
| 6 Additional requirements in the above groups 1, 2, 3, 4, and 5: of these groups two must have 3 units each, and the five groups must have a minimum total of 11 units | 4½ | 4 | 4½ | 4 | 5 |
| Minimum total | 11 | 11 | 11 | 11 | 11 |
| 7 Electives | 4 | 4 | 4 | 4 | 4 |
| Total units required for admission | 15 | 15 | 15 | 15 | 15 |

* A student may enter by meeting either the old or the new requirements until he registers for the year 1919, when the new requirements will be in full force.

** Each high school student is urged to complete two units in one foreign language.

## Conditional Admission

A student who presents fourteen (14) acceptable units may be conditionally admitted to the Freshman year. He shall be classified in the deficient work as a part of the normal amount of work allowed to students, and must remove the condition before classification for the second year's work. Students will not be permitted to remove entrance conditions by taking an examination in any subject which they have pursued in the College.

Exception to this rule: In case a student presents fifteen (15) acceptable entrance units, not including foreign language (where foreign language is required), he shall be conditioned in foreign language and may postpone the making up of the condition until the beginning of the Junior year, when he will be classified in the subject. To remove the condition, if the subject is taken in College, will require extra work to the extent of five hours a week for two semesters.

## List of Subjects

Entrance units may be allowed as indicated below, subject also to the above table as to the amount of any subject which can be used toward the 15 units. No credit will be given for less than one-half unit in any single subject.

Group 1. ENGLISH.

(1) A total of not more than 4 units, including the required 3 units. Not less than 3 semesters in Literature; and 3 semesters in Composition, Rhetoric, and Grammar, except that no credit will be given for Grammar if taken before the eleventh grade.

Group 2. HISTORY, CIVICS, AND ECONOMICS.

(1) A total of not more than 4 units, including the required unit, and not more than the maximum credit here indicated in each case; except that no credit will be given for United States History if taken before the eleventh grade.

| | |
|---|---|
| (a) Ancient History | ½ to 1 unit |
| (b) Medieval and Modern History | ½ to 1 unit |
| (c) English History | ½ to 1 unit |
| (d) United States History | ½ to 1 unit |
| (e) General History (but not in addition to Medieval and Modern History) | 1 unit |
| (f) Civics | ½ to 1 unit |
| (g) Political Economy | ½ unit |

Group 3. FOREIGN LANGUAGE.

(1) A total of not more than 4 units in any one foreign language, including the required 2 units. No credit will be given for less than one unit in any foreign language.

| | |
|---|---|
| (a) Greek | 2 to 4 units |
| (b) Latin | 2 to 4 units |

| | |
|---|---|
| (c) French | 2 to 4 units |
| (d) Spanish | 2 to 4 units |
| (e) German | 2 to 4 units |
| (f) Scandinavian | 2 to 4 units |

Group 4. MATHEMATICS.

| | |
|---|---|
| (a) Algebra (required) | 1½ units |
| (b) Plane geometry (required) | 1 unit |
| (c) Solid geometry | ½ unit |
| (d) Plane trigonometry | ½ unit |
| (e) Advanced Algebra | ½ unit |
| (f) Advanced Arithmetic (no credit can be given for arithmetic unless taken in the third or fourth year of the secondary school course or after the completion of 1½ units in algebra) | ½ unit |

Group 5. NATURAL SCIENCES.

(1) A total of not more than 4½ units will be accepted in this group.

| | |
|---|---|
| (a) Agriculture<br>Plant Industry<br>Animal Industry<br>Rural Economics<br>General Agriculture | ½ to 2 units |
| (b) Astronomy | ½ unit |
| (c) Biology, elementary | ½ to 1 unit |
| (d) Botany | ½ to 1 unit |
| (e) Chemistry, not less than | 1 unit |
| (f) General Science | ½ to 1 unit |
| (g) Geology | ½ unit |
| (h) Physical Geography or Physiography | ½ to 1 unit |
| (i) Physics, not less than | 1 unit |
| (j) Physiology | ½ unit |
| (k) Zoology | ½ to 1 unit |

Group 6. ADDITIONAL REQUIRED WORK (see table above).

Group 7. ELECTIVES. Whatever work to the extent of four additional units the accredited school certifies as accepted by that school for graduation; subject to the definitions of units of entrance credit adopted by the North Central Association of Colleges and Secondary Schools, or in bulletins published by the Iowa Board on Secondary School Relations. A total of not more than 4 units will be accepted in commercial, industrial, and miscellaneous subjects.

(1) Commercial subjects.

| | |
|---|---|
| (a) Business arithmetic (not in addition to advanced arithmetic, and only if taken after the completion of the required 1½ units in algebra or in the latter half of the high school course) | ½ unit |
| (b) Elementary bookkeeping | ½ to 1 unit |
| (c) Advanced bookkeeping | ½ to 1 unit |

| | |
|---|---|
| (d) Commercial law | ½ unit |
| (e) Stenography and typewriting | 1 to 2 units |
| (f) Business correspondence | ½ unit |
| (g) History of commerce | ½ unit |
| (h) Economic history of England | ½ unit |
| (i) Economic history of United States | ½ unit |
| (j) Materials of commerce | ½ unit |
| (k) Commercial geography | ½ unit |
| (2) Industrial subjects | |
| (a) Freehand or Mechanical Drawing | ½ to 2 units |
| (b) Manual Training, i. e., shop work | ½ to 4 units |
| (c) Domestic Science | ½ to 2 units |
| (3) Miscellaneous. | |
| (a) Public speaking. | ½ unit |
| (b) Bible | ½ to 1 unit |
| (c) Music | ½ to 2 units |
| (d) Agriculture—additional units | ½ to 2 units |
| (e) Psychology | ½ to 1 unit |
| (f) Pedagogy and methods | ½ to 1 unit |

## METHODS FOR OBTAINING THE FIFTEEN UNITS

There are four methods of obtaining the necessary units for admission to the Freshman class:

A. Admission by transfer from other colleges and universities.
B. Admission by certificate from fully accredited high schools.
C. Admission from unaccredited high schools.
D. Admission by examination and on other evidences of proficiency.

### A. Admission by Transfer From Other Colleges and Universities

Students of other colleges will be admitted to advanced standing in this college under the following conditions:

First, they must present a letter of honorable dismissal.

Second, the entrance requirements to the college must be fully satisfied.

Third, students of other colleges will be admitted and granted such credits as their work will justify. Work of recognized merit that has been taken at Colleges and Universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any of the courses offered at this College. Students taking up work in this way will present official records to the Advanced Standing Committee at the Registrar's Office to ascertain the credits to be allowed. It will be understood between the applicant and the Committee that the credits are only provisionally accepted and that their final acceptance depends wholly upon the student's maintaining a good average standing for one year in Iowa State College.

Fourth, it is required that all credits from other institutions be sent by the proper officers of such institutions, duly certified, to the Registrar of this College, such certificates to include the number of weeks the student has pursued the studies in question and the number of hours' credit received in each term, as well as the portions of the subjects covered.

Fifth, advanced or college credit may be given for extra high school or secondary school work only on the following conditions:

1. The number of units reported and accepted must be in excess of 16.
2. There must be a rigorous examination for college credit.

### B. Admission by Certificate From Fully Accredited High Schools

Graduates of fully accredited high schools of Iowa who meet fully the requirements for admission to the Freshman class, will, upon presentation of the proper uniform certificate, be admitted to the College without examination.

Graduates of schools fully accredited by the colleges of other states which have as high a standard of entrance requirements as this institution, will also be admitted as freshman upon presentation of certificate of graduation, accompanied by uniform admission certificate.

**Superintendents and principals are urged to send to the Registrar immediately upon the close of the school year, the uniform admission certificate of each graduate intending to enter the College at the beginning of the ensuing College year.** If on inspection the certificate is found satisfactory, the applicant will be forwarded a certificate entitling him to admission without examination Uniform admission certificates may be obtained by teachers and students who are candidates for admission to the College upon application to the Registrar. The certificate must show the grade of work done and text-books used in the subjects required for entrance, with a definite statement of the year of the high school in which the subject was taken, the number of recitations per week, and the number of weeks the subject was pursued during the high school course; and it must state that the applicant is of good moral character and, in the judgment of the subscriber, able to pursue college studies successfully.

If, however, applicants from accredited four-year secondary schools present the superintendent's or principal's certificate showing deficiencies not exceeding one entrance unit, together with that officer's statement that they are in good standing in the school from which they come, and that in the subscriber's judgment they are able to pursue college studies successfully, they may be admitted on condition that they make up enough credits to bring the number up to fifteen units within one year after their admission.

Diplomas of graduation will not be accepted for entrance unless accompanied by a uniform certificate as stated above.

Applicants planning to enter by certificate will be saved much trouble and annoyance, and possibly delay, by mailing their certificates in advance to the Registrar as soon as they have decided to make application. All preliminary adjustments can be made by correspondence, at the close of

which the successful applicant will be in possession of an entrance card which he will need only to present to the Treasurer for registration and to the Dean for classification.

All uniform certificates should be filed with the Registrar not later than the second Monday in August or the first Monday in January.

### C. Admission from Unaccredited High Schools

A student presenting a certificate from an unaccredited school may be admitted to collegiate courses by the following plan:

(1) He is to pass entrance examinations in acceptable subjects representing each of the main groups of subjects certified, for one-third of the number of acceptable credits so certified.

(2) The subjects for examination are to be selected by the college examiner at the time of the examination and irrespective of the choice of the student.

Each year, on the first Tuesday of May and the Monday preceding, college entrance examinations may be held in any unaccredited four-year high school applying for such examinations. The Inspector of Secondary Schools for the State Board of Education, Des Moines, Iowa, sends to the Superintendents of the unaccredited high schools of Iowa for their supervision the entrance examinations for the applicants who desire admission to the three state institutions. All papers, together with the examination questions used, should be sent to the Inspector.

In case the student fails in one or two groups of the subjects he may take another examination at the regular time set for the examinations in September and at the institution to which the student seeks admission.

(3) The total number of credits ultimately allowed on the certificate shall not exceed three times the number earned by examination.

(4) The total amount of credit gained in this way, together with additional credit for subjects not indicated in the certificate (or subjects so indicated, but not acceptable), if additional credit is needed, shall be at least 14 units. In case the student presents less than fifteen acceptable entrance units he is to be conditioned to the extent of enough units to bring the total number up to fifteen units.

### D. Admission by Examination and on Other Evidences of Proficiency

#### ADMISSION BY EXAMINATION

(A suggestive list of examination questions may be obtained from the Registrar.)

Students who desire to enter by examination and who present satisfactory evidence that they have devoted sufficient time to preparation, will be given examinations in any subjects required for entrance.

Students desiring to enter by examination will be expected to pass examinations in the required and elective subjects, according to work outlined on pages 28 to 30.

The subject matter to be covered is according to the material found in the revised edition of Bulletin No. 1, The Accredited High School, published by the State Board of Education, Des Moines, Iowa, which gives a synopsis of the amount and kind of work required for entrance.

### COLLEGE ENTRANCE EXAMINATIONS

Certificates of entrance examinations passed for admission to reputable Universities and Colleges, and certificates of examination passed under the direction of any of the College Entrance Examination Boards and the Regents of the State of New York, may be accepted as are accepted the certificates from our own accredited schools.

### ACADEMIES AND PREPARATORY SCHOOLS

Credits certified from private secondary schools such as academies and seminaries, and from college preparatory schools, shall be estimated in accordance with the definition of the entrance unit and on the standard of four years of preparation and residence. College academies or preparatory departments conforming in their organization with the organization of the four-year accredited high school shall be treated as accredited schools, if the colleges themselves are regarded as standard colleges.

### FIRST GRADE UNIFORM COUNTY CERTIFICATE

Entrance credit may be allowed for the first grade uniform county certificate in subjects marked 85 or above, as follows:

| | | | |
|---|---|---|---|
| Arithmetic | ½ unit | Economics | ½ unit |
| U. S. History | ½ " | Algebra | 1 " |
| Physiology | ½ " | Agriculture | ½ " |
| Grammar | ½ " | Domestic Science | ½ " |
| Civics | ½ " | | |

### STATE CERTIFICATE

Entrance credit may be allowed without examination for the five-year second and first grade state certificates, and for the life diploma as follows:

| | SECOND GRADE | FIRST GRADE | LIFE DIPLOMA |
|---|---|---|---|
| English | 1½ units | 3 units | 3 units |
| History | ½ " | 1½ " | 1½ " |
| Civics | ½ " | ½ " | ½ " |
| Economics | ½ " | ½ " | ½ " |
| Algebra | 1½ " | 1½ " | 1½ " |
| Arithmetic | ½ " | ½ " | ½ " |
| Bookkeeping | ½ " | ½ " | ½ " |
| Physics | 1 " | 1 " | 1 " |
| Botany | ½ " | ½ " | ½ " |
| Physiology | ½ " | ½ " | ½ " |
| Drawing | ½ " | ½ " | ½ " |
| Didactics | ½ " | ½ " | ½ " |

| | | | |
|---|---|---|---|
| Psychology | | ½ unit | ½ unit |
| Geometry | | 1 " | 1 " |
| Trigonometry | | | ½ " |
| Astronomy | | | ½ " |
| Geology | | | ½ " |
| Zoology | | | ½ " |
| Totals | 8½ units | 12½ units | 14½ units |

ENTRANCE EXAMINATION PROGRAM

Admission to the entrance examinations is by permit. Permits may be obtained of the Registrar, Room 125, Central Building.

A representative from each department will conduct the examinations in Room 102, Central Building, on Thursday and Friday preceding classification.

Any student finding a conflict in his program should report to the Registrar for adjustment.

Graduates of the unaccredited schools of the State should take the entrance examinations in May according to the instructions set forth on page 32.

Thursday:

| | |
|---|---|
| Algebra | 8-10 A. M. |
| Plane Geometry | 8-10 A. M. |
| English | 10-12 A. M. |
| Latin, first year | 1-3 P. M. |
| Latin, second year | 1-3 P. M. |
| German, first year | 1-3 P. M. |
| German, second year | 1-3 P. M. |
| Botany | 3-5 P. M. |

Friday:

| | |
|---|---|
| Algebra | 8-10 A. M. |
| Solid Geometry | 8-10 A. M. |
| History, General | 10-12 A. M. |
| History, American | 10-12 A. M. |
| History, English | 10-12 A. M. |
| Civics | 1-3 P. M. |
| Physiology | 1-3 P. M. |
| Physiography | 1-3 P. M. |
| Physics | 3-5 P. M. |
| Latin, first year | 3-5 P. M. |
| Latin, second year | 3-5 P. M. |
| German, first year | 3-5 P. M. |
| German, second year | 3-5 P. M. |

The Registrar will arrange for the other entrance examinations required by the candidates for admission.

# Advanced Standing

Students of other colleges will be admitted to advanced standing in this college under the following conditions:

First, they must present a letter of honorable dismissal.

Second, the entrance requirements to this college must be fully satisfied (see Admission from Other Colleges under Entrance Requirements).

Third, it is required that all credits from other colleges be sent by the proper officers of such institutions, duly certified, to the Registrar of this College; such certificates to include number of weeks the student has pursued the studies in question and the number of hours' credit received in each semester, as well as the portion of the subject covered.

No standing shall be accepted from any high school or academy for regular four year college work. It is, however, the privilege of any student to ask for and receive examination in any subject taught in any department of the College, provided that he can show to the satisfaction of the head of the department that he has made the necessary preparation for it.

Students in other colleges who desire advanced standing are divided into four classes:

**A. College graduates who desire baccalaureate degrees.**

A graduate of any college of approved standing may be granted the degree Bachelor of Science in any course offered by the divisions of Agriculture, Industrial Science, Engineering, or Home Economics, upon the completion of 72 credits in residence, or, in special cases, upon the completion of such number of credits as may be fixed by the committee on advanced standing

In all cases the student shall take all the required technical subjects taught by the department in which he is classified and such other technical and non-technical subjects as shall be specified by the head of the department and the dean of the Division to a total of 72. This does not abrogate the rule that all specified prerequisites or their equivalents shall be met as determined by the committee on advanced standing. Such students are registered and classified in the Senior College.

**B. Students of colleges with which Iowa State College has cooperative agreements.**

Approved colleges and universities may enter into a coöperative agreement with Iowa State College whereby the students may graduate from both institutions upon completion of five years of work.

This agreement requires the student to complete at least three years of work, securing thereby at least ninety credits — including certain specified credits — from such institutions.

The student may then enter the College as a Junior student in the division of Agriculture, Industrial Science, Engineering, or Home Economics, and graduate from the various courses offered by these divisions in two years upon the completion of 72 credits, or in special cases upon

the completion of such greater or less number as the committee on advanced credits shall recommend.

1. Students shall in all cases present at least 90 credits (40 of which shall be in science).

2. Two years shall be spent in residence at the College and at least 72 credits shall be completed here.

3. In all cases the student shall take all the technical subjects required by the major work in which he is classified, and such additional technical and general work as may be required in the course elected, but the maximum requirement will not usually exceed 72 credits. Such student will, upon entering this College, be admitted to senior college classification.

4. Information relative to the specific credits in Science, which must be included in the ninety presented, as well as list of institutions with which such coöperative agreements have been made, may be secured from the Registrar.

**C. Students of the Iowa State Teachers' College desiring to take one semester or one year of work at the College for credits toward a degree in the former Institution.**

An agreement has been entered into by the faculties of the Iowa State Teachers' College and the Iowa State College whereby students of either institution may pursue certain subjects in the other and receive credit therefor toward graduation.

Four divisions of the College — Agriculture, Engineering, Industrial Science, and Home Economics — are open to students of the Iowa State Teachers' College under this arrangement.

Any student who has completed two years of college work at the Iowa State Teachers' College may take one semester or one year of work in the College and receive credit therefor toward graduation at the former institution, subject to the following regulations:

1. All of the work taken shall consist of technical subjects from a single division of this College, or the prerequisites for such subjects.

2. For classification in college work in the Division of Agriculture or Home Economics, credits in the following subjects must be presented: Chemistry, 1, 2, and 3; physics, 1 and 2; zoology, 1 and 2; botany, 1 and 2.

For classification in the Division of Industrial Science, at least 20 credits in Science must be presented.

For classification in the Division of Engineering, credits in the following must be presented: Chemistry, 1, 2, and 3; physics, 1, 2, and 3; mathematics, 1, 2, 3, 4, and 5.

3. The student shall register as a special junior under the dean of the division concerned.

4. Students in normal (non-collegiate) classes in the Iowa State Teachers' College who cannot fulfill the college entrance requirements for college work at the Iowa State College, may take subjects offered in the two year non-collegiate courses at the College.

5. The prerequisites, or their equivalents, for the technical courses as given in the catalogue shall be met in all cases.

6. The course of study in each instance shall be made up from the subjects specified by the various divisional faculties as best meeting the needs of the students from the Iowa State Teachers' College. In any case where the student's best interest may be served thereby, the deans of the respective divisions are authorized to make alterations. Information relative to specified subjects may be secured from the registrar.

**D. Students from other colleges.**

Work of recognized merit that has been taken in colleges and universities of good rank and standing will be credited for an equivalent amount of work so far as it applies in any course offered in this College.

Students taking work in this way will present official records of their work to the advanced standing committee at the office of the Registrar to ascertain the credits to be allowed on it. It will be understood between the applicant and the committee that the credits are only provisionally accepted and that their final acceptance depends wholly upon the student's maintaining a good average standing for one year at the College.

### GRADUATE WORK IN EDUCATION AT THE STATE UNIVERSITY

After one year of study graduates of Iowa State College should be able to meet the requirements to receive the degree of Master of Arts from the State University of Iowa and receive the Masters' diploma of the College of Education of that university.

# Special Students

Students taking special work in any of the College courses must be at least twenty-one years of age, must give good and satisfactory reasons for desiring such classification, and must furnish satisfactory evidence that they are thoroughly prepared to pursue the work chosen. Permission to take such special course and the subjects included therein depends upon the approval of the President of the college and the Dean or Head of the Department in which the student seeks enrollment.

Permission to take a special course will not be granted to students until they have completed the Freshman year of some one of the courses offered, and then only for a period not to exceed two years. Exceptions to the regulations requiring the completion of the Freshman year, and to the rule limiting the special course to two years, will be made in case of persons of mature years who desire to take a particular line of scientific or technical work, and whose application to take such course is approved by the Faculty of the Division in which the student seeks enrollment, and by the President of the College.

Special students are subject to the same rules governing conditions on back work as apply to all other students. The standard prerequisites for

advanced work are subject to limited modification with the approval of the Dean of the Division in which the student is classified. A student wishing to change from a regular to a special or irregular course, either in the same or another department, will not be permitted to change from one course to another if he has a "condition" or a "not pass" in a subject not common to the two courses; or if he has more than one "condition" or "not pass" in subjects common to the two courses. Special students, as well as regular students, are subject to the conditions given under Requirements for Admission.

It is the theory of special classification that students should be particularly strong and well prepared to do thorough work in the studies they elect. A high standard of scholarship will, therefore, be required of all who are thus classified.

**Graduates of approved colleges**, who are not candidates for a degree, may take special work in this institution under the rules governing special students, without having to complete the Freshman year in any of the college courses. Permission to take such special course and the subjects included therein depends upon the approval of the President of the College and the Dean or Head of the Department in which the student seeks enrollment.

# Irregular College Students

Worthy students in good standing over twenty-one years of age, not prepared to meet the entrance requirements of the Freshman year, may be admitted without examination as irregular college students, and may pursue college work not to exceed two years, provided:

1. That they give evidence of satisfactory preparation to carry such work successfully.
2. That they show good and sufficient reasons for not taking a regular course.
3. That they present a certificate covering their entire preliminary education.
4. That they obtain written permission from the President of this College to register as irregular students.

Such students will then be registered, classified, and dealt with the same as regular College students

# Fees and Expenses

The entire expenses of a student need not exceed $400 00 per year at the College.

**Honor Scholarships:** The State Board of Education has provided one honor scholarship for each accredited high school in the state. This scholarship represents the same value in cash whether presented at the State College or at any one of the other state institutions. It is worth

$20 00 for the year, and at the State College this amount will be allowed on fees.

As soon as any school has made its nomination for the scholarship, the school authorities are expected to report the name and address of the nominee, together with a signed certificate of scholarship, to the State Inspector of Secondary Schools, State Board of Education, Des Moines, Iowa, who will approve the nomination if the conditions have been met, forward the proper credentials to the candidate, and send the certificate of credits to the institution elected.

Nominations should be made in June, and must be made not later than August 1st of each year.

**Tuition:** The Code of Iowa reads as follows: "The tuition in the College herein established shall be forever free to pupils from the state over sixteen years of age, who have been residents of this state six months previous to their admission."

To non-resident students a tuition fee of $25.00 per semester is charged.

**Tuition Scholarships:** The form of Tuition Scholarships is intended only for those students from states other than Iowa, who, without such aid, cannot secure a college education. The conditions on which this aid is granted are as follows: (1) The applicant must be in need of financial assistance; (2) the applicant must be of good moral character; (3) the applicant must give evidence of good preparation; (4) the recipient must give evidence of ability by good standing in one of the regular courses leading to the bachelor's degree.

The aid which is given from the Tuition Scholarships Fund is not regarded as a loan. If, however, a student who receives this aid is able to return the amount in later years, it will be credited to his accounts on the books of the College Treasurer, and the sum, whatever it may be, will be put into the Tuition Scholarships Fund of the College for the use of future students.

All applications for these scholarships must be made on the uniform blanks furnished by the President.

The time of filing applications with the Chairman of the Tuition Scholarships Committee, in order to secure consideration, is as follows:

First Assignment—not later than October fifteenth.

Second Assignment—not later than January fifteenth.

All freshman and other first year students will be considered only at the second assignment unless one semester's work has already been completed at the College.

Thirty-eight tuition scholarships are available: eight to each collegiate class, two to sub-collegiate students, and four to students from foreign countries.

The applicant must be considered a member of the class indicated by his classification at the Registrar's Office.

Payment of the tuition scholarship to the recipient will be made as follows: the amount of the first semester's tuition ($25.00) will be placed to the credit of the recipient with the College Treasurer when the scholar-

ship is awarded; and the amount of the second semester's tuition ($25.00) will be placed likewise—only, however, when the recipient has completed his registration for the second semester. The payment of scholarships awarded at the second assignment may be made as stated above, but in one amount ($50.00), when the student has completed his registration for the second semester.

Renewal of tuition scholarships will be made from year to year only upon the presentation of a new blank. In no case is this aid granted for more than one year, unless the applicant is re-entered in the competition and re-awarded a scholarship.

NOTE: Prospective freshmen should carefully consider the cost of the first year. No one should think of entering college unless he has money enough in his own right or from friends to meet his expenses in large part for his freshman year. If he goes out of his freshman year in debt he is quite sure to be seriously embarrassed for the remainder of his college course. Provision should be made to meet college bills with the same business like promptness with which one expects to meet other bills.

**Incidental and Janitor Fees:** The regular incidental and janitor fee for the semester is $10.00 for all students who complete their classification during the regular classification period, Saturday and Monday. Beginning with the first day on which classes are held the fee for college students will be $12.00 plus $1.00 additional for each day thereafter until the classification is completed. This fee is used as follows: hospital, $2.50; students' repair fund, $1.00; incidental and janitor service, balance. For sub-collegiate fees see page 322.

**Laboratory Fees:** Laboratory fees at the actual cost of breakage and usage are charged to the students, the Treasurer's receipt for such fees being required before the students are admitted to laboratories. For the amount of the fee in any study, see description of the study under its department.

**Board and Room:** About three hundred twenty-five young women can secure rooms in Margaret Hall and the new dormitories. Students rooming in these buildings will be furnished with bed, mattress, rug, chairs, dresser, and table. Students will furnish bedding and such other articles as they need.

The price for rent, heat, and light will be from $8.00 to $16.00 per month for the double rooms, according to the size and quality of the room. The room rent will be for the semester. Each semester's rent is payable in advance at the Treasurer's office. In case of failure to take the room after making the deposit, the student will forfeit $10.00. There are twenty single rooms. In the other rooms two persons will divide the rent. The Advisor for Women reserves the right to assign two persons to each room if necessary.

All young women rooming in dormitories on the campus are required to board at the boarding halls of their respective dormitories. All other students can secure furnished rooms and board in clubs or private families adjacent to the college grounds at $5.75 per week.

In order that undesirable rooms and houses may be avoided, all young women students are required to secure rooms through the Advisor for

Women, and the young men students should consult the Secretary of the Young Men's Christian Association, Alumni Hall, Ames, Iowa. For sanitary or other reasons the college authorities reserve the right to forbid students from rooming in any particular house.

No group of young women students may establish a "house" or "home," or make any definite plans in such direction, without the full knowledge and approval of the President and the Advisor for Women. No young woman may become a resident of a sorority house until after she has been initiated into the sorority.

For the information of students, clubs, and interested private families the Committee on Student Accommodations has prepared standard regulations to assist in the management of houses which furnish room or board to students. These regulations are for the use of members of the instructional and clerical staffs and other members of the college community when reference to standard practice is desirable. Houses accommodating both students and others who are not students are expected to observe regulations for houses accommodating students. Copies of these regulations may be secured from the President's office, the Y. M. C. A. Secretary, or the Chairman of the Committee on Student Accommodations.

**Diploma Fee:** A diploma fee of $5.00 is payable before graduation.

**Text Books:** All text books and stationery may be purchased at the College Book Store at about 20 per cent below the average retail price.

### Freshman Expenses

Taking into consideration the items named under Fees and Expenses, the following is an approximate estimate of the expenses of a freshman for each of the two semesters of the college year:

| | Minimum Amount | Maximum Amount |
|---|---|---|
| Board (18 weeks) | $72.00 | $90.00 |
| Room rent (18 weeks—basis of two in a room) | 27.00 | 36.00 |
| Laundry | 9.00 | 12.50 |
| Incidental and Janitor Fee | 10.00 | *12.00 |
| Laboratory Fees | 15.00 | 25.00 |
| Books and Equipment | 19.50 | 45.00 |
| | $152.50 | $220.50 |

For engineering students, the minimum estimate should be increased fifteen dollars, under Books and Equipment, for drawing instruments and material.

In addition to these items at the beginning of the freshman year the men students will have to purchase a military suit at $17.50 (subject to market changes) and a gymnasium suit for $3.95; and the women students, a gymnasium suit for $7.00. The students are also advised to purchase a students' activity ticket and to pay class dues, which items would amount to about $6.00 for the entire year.

* See Incidental and Janitor Fees, page 40.

The military and gymnasium suits and drawing equipment will be serviceable for the entire course.

If a student is a non-resident of the state $25.00 per semester should be added for tuition.

The incidental and janitor fee, laboratory fees, books and equipment, five-dollar deposit for military suit, gymnasium outfit, and some payment toward room rent and board are required in advance.

# Classification and Standings

**Junior and Senior College:** The students are classified in Junior and Senior colleges. The Junior college is composed of all students in the Freshman and Sophomore years; the Senior college, of all students in the Junior and Senior years.

**Amount of Work:** The amount of work in each course is expressed in credits, a credit meaning one recitation a week, or its equivalent, throughout the semester. It is considered that a one-hour recitation or lecture will require as much time including preparation as a three-hour laboratory, and therefore is given the same credit. Any two-hour laboratory period is equivalent to two-thirds of a three-hour laboratory.

**Number of Credits:** No student shall be allowed to classify in more credits than are specified in the catalogue for the semester of the course taken, unless he has an exceptionally high record in his previous college work, and then only after consent is secured from the Dean of the Division and the Head of the Department concerned. The student will be allowed to drop such extra work only upon permission of the Dean; he will be required to drop it in case this or any other work in this schedule is being carried unsatisfactorily. A "condition" or a "not pass" secured in such extra work shall stand as a record, and shall be considered in choosing fraternity members, but shall not be held against the student for graduation.

In general, students failing in any portion of a term's work will not be allowed to take full classification for the next semester.

**Classification:** No student shall be admitted to any class or dropped from it, except by authority of the classifying officer.

**Conflicts:** Students shall not classify in conflicting studies without the approval of the classifying officer.

**Standings:** All the standings are based on the scale of 100. The passing grade is 75 A student receiving from 60 to 74 per cent inclusive in any course is conditioned, and allowed to make up the condition under the direction of the head of the department.

**Back Studies:** Students shall be classified in back studies in all cases in which such studies are taught, subject to the first rule under Number of Credits. Any exception to this rule must be for good and sufficient reason, approved by the President of the College and the Dean.

**Changing Course:** A student will not be permitted to change from one course to another who has a "condition" or "not pass" in a subject not common to the two courses; or if he has more than one "condition" or "not pass" in subjects common to the two courses.

**Senior Year:** No student shall be considered a candidate for graduation who at the beginning of the second semester of the Senior year has more than twenty hours of work to complete his course of study. If the uncompleted work is not offered in the second semester, it shall be passed and reported to the Recorder not later than April first.

# Examinations in Back Work

Examinations for back work for matriculated students will be conducted at the opening of the fall semester, on the Thursday and Friday preceding classification days, as follows:

**Thursday**

8-10 A. M —Farm Crops.....Farm Crops lecture room, 307 Hall of Ag.
8-10 A. M.—Mining Engineering.....Room 306, Engineering Hall
8-10 A. M.—Zoology... .... ..... ...Room 308, Science Building
10-12 A. M.—Agricultural Education.....Room 318, Hall of Ag.
10-12 A M —English..... ..... Rooms 1 and 3, Central Building
10-12 A M.—Civil Engineering..... ..Room 312, Engineering Hall
10-12 A M.—Forestry..... .....Room 210, Hall of Ag.
10-12 A. M.—Veterinary Medicine . ... . . ..Veterinary Building
10-12 A M.—Geology..... .... .....Room 306, Engineering Hall
1- 3 P M.—Mechanical Engineering. . .Rooms 204 and 205, Engr. Hall
2- 4 P M —History—Psychology.... .....Room 208, Central Building
3- 5 P. M.—Public Speaking.....Room 308, Central Building
3- 5 P. M.—Electrical Engineering.....Room 205, Engineering Annex

**Friday**

8-10 A. M.—Horticulture ... .....Forestry room 210, Hall of Ag.
8-10 A. M.—Chemistry..... .....Room 198, Chemistry Building
8-10 A. M.—Mathematics.....Room 221, Central Building
8-10 A M.—Animal Husbandry.. .A H. lecture room 117, Hall of Ag.
10-12 A. M.—Economic Science . Room 222, Central Building
10-12 A. M.—Dairying.....Room 8, Dairy Building
10-12 A. M.—Botany.....Room 312, Central Building
10-12 A. M.—Farm Management.....Room 308, Hall of Ag.
1- 3 P M.—Civics .....Room 102, Central Building
1- 3 P. M.—Mechanical Engineering.. ...Rooms 204 and 205, Engr. Hall
1- 3 P. M.—Home Economics.....Home Economics Building
2- 4 P. M.—Modern Language.....Room 119, Central Building
2- 4 P. M.—Agricultural Engr.....Engr. lecture room, Agr. Engr. Hall
3- 5 P. M.—Bacteriology.....Room 105, Science Building

3- 5 P. M.—Soils.....Soils lecture room 8, Hall of Ag.
3- 5 P. M.—Physics.....Room 207, Engineering Hall

Preceding the Spring Semester, such examinations will be given on the Monday before the close of the Christmas vacation, the hours being the same as given above. Conflicts will be arranged by the departments concerned.

# Graduating Thesis

All candidates for graduation in the engineering and agricultural courses except the forestry students are expected to present a satisfactory thesis.

The subjects for theses shall be selected under the direction of the professor in whose departments they are written, and shall be submitted to the Thesis committee, with signed approval of the professor, at the beginning of the semester in which the student starts his work.

It is expected that each thesis shall represent an amount of work equivalent to at least one exercise per week through the Senior year; that it shall show the result of the student's personal study or investigation and be throughout original in matter and treatment so far as the nature of the subject will permit; that it shall be prepared under the supervision of the professor in charge, the student making frequent reports of progress and having an outline of matter ready for approval by the first week of the last semester.

The complete thesis shall be submitted to the Thesis Committee on or before May 25th.

## PRIZE FOR THESIS

A prize of $10.00 for the best thesis on the subject, Relation of Poisonous Plants to Live Stock Industry of Iowa, is also offered by L. H. Pammel. This prize is open to students in the Agricultural, Industrial Science, and Veterinary Medicine Divisions.

# Divisions

## Division of Agriculture

DEAN CURTISS, Agricultural Hall, Room 124
VICE-DEAN BEACH, Agricultural Hall, Room 201

The Division of Agriculture is made up of all of the departments in the college devoted to the various phases of technical and practical agricultural work. The work of these departments is closely related and the purpose of all of them is to train men for better service in agriculture.

The faculty of the Division of Agriculture is made up of the members of all of the departments within the Division and representatives of the departments in other divisions whose work serves to prepare agricultural students for a better mastery of technical work in agriculture. Under this head the following departments are included: Bacteriology, Botany, Chemistry, Civil Engineering and Architectural Engineering and Rural Structures, Economic Science, Electrical Engineering and Mechanical Engineering, English, History and Psychology, Home Economics, Mathematics, Modern Language, Public Speaking, Veterinary Anatomy and Veterinary Surgery, Veterinary Physiology and Veterinary Pathology, and Zoology.

The departments in the Division of Agriculture are as follows:

**Agricultural Education** (page 82): Agricultural Hall.

**Agricultural Engineering** (page 87): Administered jointly with the Engineering Division. Agricultural Engineering Hall.

**Agricultural Journalism** (page 97): Agricultural Hall.

**Animal Husbandry** (page 100): Including Poultry and Dairy Husbandry. Agricultural Hall.

**Correspondence Study—Agriculture (Collegiate Grade)** (page 97): Agricultural Hall.

**Dairying** (page 165): Dairy Building.

**Farm Crops and Soils** (page 185): Agricultural Hall.

**Farm Management** (page 195): Agricultural Hall.

**Horticulture and Forestry:** Forestry (page 199), Pomology (page 229), Floriculture (page 231), Truck Crops (page 234), and Landscape Architecture (page 240). Agricultural Hall.

**Photography** (page 285): Agricultural Hall and Chemistry Building.

**Agricultural Experiment Station** (page 389).

The Division of Agriculture offers the following courses:



(For non-collegiate courses, see pages 327, 329, 334, and 350).

These courses afford the student opportunity for pursuing study along that line of agriculture which he is especially suited to follow. The farm as it is usually conducted is a unison of many branches of industry; and these courses are so arranged as to direct the student into that branch which will call forth and centralize his special ability, and at the same time will prepare him to meet successfully the peculiar difficulties of his chosen work.

In the courses in practical and scientific agriculture a field of work which is unsurpassed by any other college in the United States is open to our students. The national government endowment fund and annual appropriations for original experimentation and instruction in Agriculture and the sciences related to this industry, supplemented by liberal state aid, enable the college authorities to make the fields, barns, orchards, and gardens veritable laboratories of extensive and most practical investigation and instruction. Just recently there have been added to the equipment of the college a new chemistry building, a new horticultural laboratory covering over 20,000 square feet of space, a farm of one hundred sixty acres to be used for experimental work in farm crops, a new science hall, also an Animal Husbandry laboratory and a dairy barn modern in every respect.

The Agricultural Experiment Station is bringing to light better methods of feeding, more remunerative systems of cropping, improved strains of fruits, and other improvements which bid fair to revolutionize certain branches of Iowa agriculture. These investigations are studied by the students first hand, and through the system of student employment a number take an active part in carrying on the work of the Experiment Station. This arrangement gives to the students clearer insight into scientific methods and at the same time valuable practical experience.

In addition to laboratory work at the college, students are encouraged to visit various commercial enterprises throughout the state. Farms, orchards, stock shows, and other commercial institutions that have proved themselves of particular merit are visited by students in company with specialists from the college.

The courses of study in this Division are designed to teach the sciences that underlie practical agriculture, and sufficient English, literature, mathematics, history, and other supplementary subjects to sustain both scientific and practical agriculture and to develop the agricultural student to the level of the educated in other professions

Special attention is given to improved methods in all the various operations of farming and farm building, in the use of tools and machinery, and in the management of all kinds of stock and crops. Instruction embraces not only the principles but also the practice of agriculture. The great practical value of the courses is shown by the records of those students who have completed them and who have gone back to the farm; it is also shown by those who upon graduation have taken up the work of specialists as teachers or investigators. Such men are proving themselves leaders in their various lines.

A new course in Farm Management is offered to train men to meet the growing demand for capable farm managers, county agents, and similar work This is a five-year course, four years being spent at the college and the fifth year in practical work away from the college. There has never been a time when there was such a wide demand for graduates combining thorough scientific training with good practical experience in agriculture. Probably no other field at present offers such good opportunities for profitable employment at good salaries as are open to the men who attain high proficiency in this work.

The Division offers exceptional opportunity to graduate students in Agriculture. The strong instructional staff and extensive equipment draw students from many states

**Teaching and Research Fellowships and Scholarships.** There are about thirty teaching and research scholarships and fellowships awarded annually in the division of agriculture to graduate students. These scholarships are awarded strictly on merit and carry a stipend of $200 to $500 each. Application should be made during the second semester of the preceding year.

**Tuition Scholarships.** For information see page 39.

**Department of Agriculture Scholarships.** The State Department of Agriculture offers scholarship prizes in this institution amounting to $600. These scholarships are awarded at the Iowa State Fair, based upon boys' stock and grain judging contests. There are five scholarships, ranging from $200 to $25. The winners of the contest receive the money in monthly instalments during the year of college work, with the exception of the $25 scholarship which applies upon the winter short-course. These scholarships offer opportunities for young men to receive substantial aid

toward paying the expenses of a college education; many excellent students have come to this institution by this means.

**The Clay, Robinson & Company Fellowship.** Since the organization of the International Livestock Exposition, Clay, Robinson & Company of Chicago have offered $1,000 annually to be competed for by the various agricultural colleges in their livestock exhibits at the International. This institution has always won a large share of these premiums, and the funds have been used to provide for a fellowship in agriculture to aid worthy students in advanced study. These fellowships have materially aided young men to make a better and more thorough preparation for agricultural teaching and investigation and for practical work on the farm.

**Zimmerman Memorial Prize.** Mr. W. F. Zimmerman of Chicago, has established a permanent fund in memory of his son Herbert, an exemplary young man who lost his life through an accident while enrolled as a student in the Department of Horticulture. The income of this fund, now not less than $20.00, is offered as a prize each year to the Superior Junior Horticultural Student. All Horticultural students enrolled as Juniors are eligible for the prize.

The award will be made on the basis of ability, scholarly attainment, character, and interest in affairs which are worthy the attention of students who are preparing themselves to do the best possible work as horticulturists and as citizens.

**Clubs and Agricultural Organizations.**

| NAME | TIME OF MEETING | PLACE |
|---|---|---|
| Agricultural Club | 1st Thurs. of mo., 7:15 | Agr. Auditorium |
| Saddle & Sirloin Club | Alternate Thurs., 7:15 | Room 117, Agr. Hall |
| Horticultural Club | Alternate Thurs., 7:15 | Room 208, Agr. Hall |
| Forestry Club | Alternate Thurs., 7:15 | Room 210, Agr. Hall |
| Agronomy Club | Alternate Thurs., 7:15 | Room 7, Agr. Hall |
| American Society of Agronomy | 2nd Tues. of month | Room 306, Agr. Hall |
| Curtiss Club | Alternate Thurs., 7:15 | Agr. Auditorium |
| Dairy Club | Alternate Thurs., 7:15 | Room 11, Dairy Bldg |
| Alpha Zeta Fraternity | 1st & 3rd Tues. of mo. | Room 19, Agr. Hall |
| Gamma Sigma Delta Fraternity | 1st & 3rd Tues. of mo. | Room 7, Agr. Hall |
| Agricultural Engineering-ing Society | Tuesday, 4:00 P. M. | Room 204, Agr. Engr. Bldg. |
| Agr. Education Club | Alternate Thurs., 7:15 | Room 109, Agr. Hall |
| Farm Management Club | Alternate Thurs., 7:15 | Room 120, Agr. Hall |

**Honorary Agricultural Fraternities.** There are two national honorary agricultural fraternities that have chapters at the Iowa State College, the Alpha Zeta and the Gamma Sigma Delta. Eligibility to these fraternities

is based upon scholarship, and membership is limited to the upper two-fifths of the junior and senior students of all courses in the division of agriculture.

**Agricultural Publications.** The students in the Division of Agriculture, under the general supervision and direction of the department of Agricultural Journalism, publish a monthly journal known as "The Agriculturist." This publication has taken high rank in its class, and it affords students an opportunity to get practical training and experience in agricultural writing. In addition, considerable of the most meritorious work of advanced students in agricultural journalism is used by the agricultural press and by daily and weekly papers.

The "Ames Forester" is an annual published by the Forestry Club. The students, with the assistance of the alumni working in the field, have made this an attractive publication of a technical character.

# Division of Engineering

DEAN *MARSTON
DEAN BEYER, Engineering Hall, Room 315

The Division of Engineering consists of all the college departments devoted mainly to technical engineering work, together with the Physics Department. These departments are organized into a Division for the purpose of coördinating their work and promoting its quality and efficiency.

The Division was first organized about 1898. A dean was first appointed, for more effective administration, in 1904.

The faculty of the Division of Engineering is made up of the members of all the departments within the Division, and of voting representatives from the outside departments which are teaching important work to engineering students, or whose students are taught important work in the Engineering Division.

The departments within the Division are as follows:

**Agricultural Engineering** (page 87) Administered jointly with Division of Agriculture. Agricultural Engineering Hall.

**Architectural Engineering and Rural Structures** (page 110) Engineering Hall.

**Ceramic Engineering** (page 133) Ceramics Building, Engineering Annex.

**Chemical Engineering** (page 137): Administered jointly with Division of Industrial Science. Chemistry Building.

**Civil Engineering** (page 152) Engineering Hall, Engineering Annex, Civil Engineering Laboratory, Transportation Building.

**Electrical Engineering** (page 174): Engineering Annex

**Mechanical Engineering** (page 258): Engineering Hall, Engineering Annex, Steam and Gas Laboratory, Transportation Building, Machine Shop, Forge Shop, Foundry, Pattern Shop.

**Mining Engineering and Geology** (pages 277 and 210): Engineering Hall, Ceramics Building.

**Physics** (page 292): Engineering Hall, Engineering Annex, Ceramics Building.

**Engineering Experiment Station:** Engineering Hall, Engineering An-

* On leave of absence for Military Service.

nex, Ceramics Building, Chemistry Building, Civil Engineering Laboratory, Steam and Gas Laboratory, Transportation Building.

**Engineering Extension and Trade School:** Chemistry Building; rooms in various engineering buildings.

Departments outside the Division which have voting representatives (to the number indicated) in the Engineering faculty are as follows: Agricultural Journalism (1), Agronomy (1), Chemistry (2), Economic Science (1), English (1), History and Psychology (1), Home Economics (1), Horticulture and Forestry (1), Mathematics (2), Modern Language (1), and Public Speaking (1).

The work of the Engineering Experiment Station and the Engineering Extension Department is quite different in character from that of the other departments within the Division, and is separately organized, but is closely coordinated with the regular collegiate instruction.

The Division of Engineering offers the following courses of study:

Four-Year Courses



Two-Year Course



(For six-year courses, see the provision for Engineering courses for collegiate graduates, A , page 35.)

(For Graduate courses, see page 63.)

(For Non-Collegiate courses, see page 337.)

The Civil and the Mechanical Engineering courses were established in 1869, when the college first opened its work. Electrical Engineering was added in 1891, Mining Engineering in 1894, Ceramic Engineering in 1906, Chemical Engineering, Agricultural Engineering in 1909, and Architectural Engineering in 1914.

The purpose of all the engineering courses is to afford the student opportunity to secure the thorough fundamental and technical education which is necessary for professional work of the highest grade in engineering. The education aimed at includes training of the moral, mental, and social faculties of the student, and the maintenance and improvement of his health. Many powerful college influences in addition to the regular instruction in the courses of study contribute actively to this education.

All the studies of the engineering courses, the technical as well as the fundamental and general, have great cultural value. In this modern age no person is entitled to claim the broadest culture who is not well informed on the applications of modern science. In the engineering courses effort is made to help fit the graduate to become a good business man and a good citizen, as well as a good engineer, and to help fit him to enjoy the higher satisfactions of cultured life.

The studies of the engineering courses, though of great variety, classify naturally into two groups:

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All the studies of the engineering courses, the technical as well as the fundamental and general, have great cultural value. In this modern age no person is entitled to claim the broadest culture who is not well informed on the applications of modern science. In the engineering courses effort is made to help fit the graduate to become a good business man and a good citizen, as well as a good engineer, and to help fit him to enjoy the higher satisfactions of cultured life.

The studies of the engineering courses, though of great variety, classify naturally into two groups:

First, **fundamental and general studies,** mainly in the Freshman and Sophomore years, but extending in lesser amount through the Junior and Senior years.

Second, **technical studies,** which make up about one-fourth to one-third of the courses during the Freshman and Sophomore years, and by far the greater part during the Junior and Senior years.

The **fundamental and general studies** bear the same relation to an engineering education that a foundation bears to an engineering structure; hence, they constitute perhaps the most important part, without which the technical work cannot be undertaken successfully. The engineering student must master these fundamental and general studies with great thoroughness, and should undertake them with enthusiasm. They include the following:

**Mathematics.** The study of mathematics continues through at least two years; mastery of mathematics is absolutely essential to a proper knowledge of engineering science and to the successful practice of the engineering art.

**Chemistry and Physics.** Every engineer should be thoroughly grounded in both these subjects, one or both of which apply directly in practically all his work.

**English.** A thorough mastery of English is essential to the engineer, whose highest work is in dealing with men. He must be able to convince men by well written business letters and engineering reports, and, if he amounts to much as an engineer, by well written articles for engineering journals and papers for engineering societies. Also he must be able to present his views orally to employers and superior officers in a clear and convincing manner. The work in English in the engineering courses is very thorough in the general principles and applications, and in addition includes special work in business English and the writing of engineering reports and papers. The student is offered opportunity to take special instruction in public speaking, and even in engineering journalism.

**Economic Science** is one of the required studies in the engineering courses.

**Electives.** Opportunity is offered in the Junior and Senior years for engineering students, especially the best students, to elect considerable work outside their required subjects, and thereby obtain a broader and better rounded education. All studies in the college are open to such students as are prepared in the prerequisites stated in the catalogue.

The **technical subjects** in the engineering courses are of too great variety to be described here, but are fully explained in the catalogue under the headings of the individual departments. A thorough course in engineering mechanics is required of all. The technical studies extend throughout the entire four years' work, and the technical work in the various lines is intended to be of the most thorough and complete and high-grade character practicable in an engineering school.

In addition to the undergraduate engineering work **graduate studies** are offered, as shown in detail on page 63.

**Five-year courses** have also been arranged **in cooperation** with the Division of Industrial Science, and in coöperation with several outside Iowa colleges. See page 35. These coöperative five-year courses entitle the student to receive two degrees, a Science degree at the end of the first four years, and an Engineering degree at the end of the five years.

**Graduates of Standard Colleges** can secure an engineering degree at the Iowa State College by two years additional technical work. See page 35.

**Engineering Degrees.** The four-year courses lead to the degrees of Bachelor of Science in Civil Engineering, Mechanical Engineering, etc. See page 50.

Each five-year coöperative course leads to two degrees: first, Bachelor of Science; second, the same technical engineering bachelor's degree as a regular four-year engineering course. See page 50.

The professional engineering degrees of Agricultural Engineer, Architectural Engineer, Ceramic Engineer, Civil Engineer, Electrical Engineer, etc., are given only for successful outside engineering practice following a standard college engineering course. See page 61.

The degree of Master of Science in Mechanical Engineering, Mining Engineering, etc., is given only for completion of a resident graduate course in engineering. See page 59.

Besides the regular studies of the engineering courses, other agencies contribute in important degree to the professional education of the engineering students:—

**Technical Lectures.** Throughout the Freshman year all engineering students meet for technical lectures delivered by members of the engineering faculty; these lectures constitute a general introduction to the engineering profession.

**Engineering Societies.** After the Freshman year general professional association and advance are promoted by the Engineering Societies, of which there are several.

**American Society of Agricultural Engineers** (Local Student Branch). This meets every two weeks. All Junior and Senior agricultural engineering students are members.

**Crockets.** This is an organization composed of Sophomore, Junior, and Senior students in the department of Architectural Engineering and Rural Structures. This society holds meetings every two weeks.

**Civil Engineering Society.** This meets every two weeks. All Sophomore, Junior, and Senior civil engineering students are members.

**American Institute of Electrical Engineers (Local Student Branch).** This Society is a branch of the great national electrical engineering society, and membership is open to Junior and Senior electrical engineers.

**Engineering Society.** The Engineering Society includes all the engineering students as members, and is the student organization which di-

rects important meetings and other affairs of interest to the entire body of engineering students. Examples are the **Engineering Campfire** every fall, the Engineering Socials, and addresses of general engineering interest by prominent outside engineers.

**American Institute of Mining Engineers** (Local Student Branch). This society is a branch of the great national mining engineering society.

**Engineering Seminars.** Engineering Seminars are a feature of the advanced engineering work common to practically all courses. In several courses the work is merged in that of the engineering societies, but in Mechanical and in Electrical Engineering the Seminar meets weekly for presentation of technical papers and discussion of engineering subjects.

**Tau Beta Pi.** This honorary engineering society maintains a strong local chapter, to which only the highest one-fourth (in scholarship) of the Juniors and Seniors are eligible. A feature of the work of the Chapter is an annual address to the Freshman and Sophomore engineers by some prominent outside engineer.

**Non-Resident Lectures.** Through the various engineering societies, and by direct action of the college, the engineering students are afforded every year the opportunity of hearing a number of valuable addresses on engineering subjects by masters of the engineering profession engaged in active work outside.

**The Iowa Engineer.** The engineering students publish monthly during the college year an engineering journal called "The Iowa Engineer" The editors are elected by the engineering students. Articles are contributed by engineering alumni, non-resident engineering lecturers, and members of the engineering faculty, as well as by the editors and reporters. Engineering journals are becoming so numerous and important that experience on "The Iowa Engineer" staff is very valuable.

**Opportunities for Engineering Graduates.** While the demand for engineers has an intimate relation to general business conditions, yet our graduates have found little difficulty in securing positions which afford excellent opportunities to make good. In normal times the demand for our engineering graduates considerably exceeds the supply

**Engineering Alumni.** The engineering alumni of the Iowa State College are scattered over the entire country in most responsible positions A $20,000,000 railway terminal in Chicago, the Florida East Coast Railway, State Highway Commission work, the work of the greatest bridge companies, great water power plants, the sewerage of Havana, important harbor improvement work, great mining operations, important manufactures, electric railways, central power stations, public utilities, the valuation of the railways of the United States, are some of the lines in which they are engaged. Engineering alumni of the college are numerous in the Philippines, Cuba, Mexico, and South America, and did important work in building the Panama Canal Most satisfactory of all, hundreds are engaged in successful and important engineering work in Iowa; these men are doing great and valuable service in developing and improving the state.

# Graduate Division

PRESIDENT RAYMOND A. PEARSON, Acting Dean

## HISTORY AND ORGANIZATION

The instruction and training of graduate students has been one of the functions of the Iowa State College since its early history. The first degree of Master of Science was conferred in 1877. In 1879 the first degree of Civil Engineer and the first degree of Master of Philosophy were conferred. In early years the department or departments in which the student was registered mapped out the applicant's course and supervised his work. Later, when the divisions of the College had been created, each division controlled its own graduate work. It was not long, however, until the number of graduate students and the diversified character of their work demanded further organization, and a Graduate Committee from the General Faculty was appointed to supervise the work of all graduate students. This Committee was in charge until 1913 when the increase in the graduate work made it necessary to perfect still further the organization, and the Graduate Division was established. Soon thereafter a new Graduate Committee was appointed from the members of the Graduate Faculty. This committee is entrusted with the powers of the Graduate Faculty when it is not in session. The Graduate Division is administered by the Acting Dean and the Graduate Faculty Under this organization the graduate work to be pursued in any case is under the Acting Dean, the head of the department, and the professor in charge of the work.

## GENERAL STATEMENT

The Iowa State College of Agriculture and Mechanic Arts offers major and minor work for the degree of Master of Science in the following subjects with special application to the industries: agricultural education, animal husbandry, bacteriology, botany, chemistry, dairying, economics, engineering, farm crops and soils, farm management, forestry, geology, horticulture, mathematics, physics, veterinary anatomy, veterinary pathology, veterinary physiology, and zoology. Graduate instruction leading to the degree of Doctor of Philosophy is also offered in farm crops and soils, animal husbandry, bacteriology, botany, chemistry, dairying, geology, horticulture, and zoology. Additional minor supporting work is offered in other departments to supplement graduate study along technical lines.

## FACULTY

The president, the deans, the heads of the departments in which graduate instruction is authorized, and other members of the faculties who are in immediate charge of graduate instruction are members of the Graduate Faculty.

## AIMS AND METHODS

This is a time of great military, commercial, scientific, and social interests, and these interests are demanding greater economy, specialization in science, and more humanitarianism. To meet these demands the leaders in the different lines of industry, science, and social affairs must have access to more specialized training than can be secured in four years of study. The man who would be successful as an expert in any of the different lines of agriculture, or as a skilled chemist, engineer, botanist, bacteriologist, applied economic science expert, or as a teacher or investigator in any of these subjects can by graduate training so increase his efficiency as to open up opportunities otherwise denied him. The development of scientific agriculture, engineering, manufacturing, and the supporting sciences is dependent upon this training. The Iowa State College has long since realized its responsibility in the further development of the many lines of research work in harmony with the industrial needs of the commonwealth.

Lectures, laboratory work, and seminar methods in which the student is in contact with his research problems are used in the development of the graduate work. The investigative work is shared by instructor and student, and the student acquires the spirit as well as the methods of productive work. To further encourage this spirit of research, provision has been made for the publication of specially meritorious work along some of the lines of investigation of which the institution has charge.

## FEES AND EXPENSES

**Incidental and Janitor Fee:** The regular incidental and janitor fee for the semester is $12.00, but all students who classify during the classification period, Saturday and Monday before College work begins, will be charged only $10.00 a semester. Graduate scholars and fellows are required to pay a two-dollar and fifty cents hospital fee, a fee of one dollar for each hour's work up to seven hours, and laboratory fees in their minor only.

**Laboratory Fees:** Laboratory fees at the actual cost of breakage and usage are charged to students, the Treasurer's receipt for the fee being required before the students are admitted to laboratories. Some fees represent charges for mimeograph notes which are furnished at cost; usually when these notes are supplied no text book is required and the fee is in lieu of text book purchase. Deposits are required in some departments to cover the value of equipment loaned to students, and at the end of the term the amount is returned less deduction for loss and breakage. For the amount of the fee in any study the student should refer to the description of studies under the department in which the study is taught. Scholars and fellows are exempt from laboratory fees in their major work.

**Diploma Fee:** For the Master's, Doctor's, or Professional Degrees, $5.00. This does not include the cost of the Master's or Doctor's hood.

## CLUBS AND SOCIETIES

In the interest of research and investigation along the lines of applied science and for training in the presentation of results, several clubs and societies have been organized by the instructors and students in the different departments Among these are the following:—

Graduate Club
Iowa Section of American Society of Agronomy.
Botany Seminar.
Physics Seminar.
Applied Social Science Club.
Mathematics Colloquium.
Bacteriology Seminar.
I. S. C. Branch of the American Institute of Electrical Engineers.
Chemistry Seminar.
I. S. C. Branch of the American Institute of Mining Engineers.
Civil Engineering Society.
I. S. C. Branch of the American Society of Agricultural Engineers.

## HONORARY FRATERNITIES

The following is a list of the Honorary Fraternities of Iowa State College, some of which are maintaining regular programs along lines of research work:—

Phi Lambda Upsilon.
Phi Kappa Phi
Alpha Zeta.
Tau Beta Pi.
Gamma Sigma Delta.
Omicron Nu.
Delta Sigma Rho.

## ADMISSION

Graduates of Iowa State College, as well as graduates of other colleges and universities of approved standing, are admitted to the Graduate Division. Before entering upon graduate work in any department, however, the applicant must present evidence that he has had the prerequisite training that will enable him to pursue with profit the courses desired. It should be remembered, also, that admission to graduate work does not necessarily imply admission to candidacy for a degree.

Graduate students wishing to become candidates for the Master's or Doctor's degree will make application in writing to the Dean of the Graduate Division not later than February 1 of the year in which the degree is sought. This application should be approved and signed by the head of the department in which the major subject is offered and by all other members of the faculty under whom the student has done work in support of his candidacy. If the applicant has completed any graduate work in another institution, an authorized statement of the same should be filed with the application for candidacy for degree.

For purposes of admission to the Graduate Division an approved college or university is one which requires four years of work of collegiate grade for graduation, based upon an entrance requirement of at least fourteen standard high school units.

Candidates for admission to the Graduate Division are required to submit to the Registrar a complete authorized statement of their

college or university records, including a statement of their entrance credits. A blank application for admission which contains definite instructions regarding admission may be secured from the Registrar or Dean.

When an application has been approved, the Registrar issues a permit to enroll. Upon the payment of fees the candidate is given a receipt which he presents to the Dean, the classifying officer.

Registration should be on regular classification days to avoid payment of extra fee, and it should be completed within two weeks after the opening of a semester to receive full credit for the semester's work.

## CLASSIFICATION

The classification of all *regular* graduate students must be completed in conformity with the following rules:—

1. Fifteen credit hours each semester shall constitute full-time graduate work.

2. A major subject allowed by the rules of candidacy for the degree shall be chosen; all major, minor, and supporting work shall be outlined in consultation with the head of the department in which the major is taken.

3. Unless otherwise specially permitted a graduate student shall carry at least one study of strictly graduate grade each semester. In any case at least four hours of strictly graduate work must be completed each year

4. The course of study as outlined shall not be amended or changed except by the approval of the Dean of the Graduate Division, and any such change shall be in writing and shall be filed with the original course of study.

5. The courses of study as outlined shall be made out in triplicate: one copy shall be retained in the files of the department in which the major work is taken, one shall be filed in the office of the Dean of the Graduate Division, and one in the office of College Registrar. Each copy shall be signed by the head of the department in which the major work is taken, by the instructor who will have immediate charge of the major line of work, and by the Dean of the Graduate Division.

6. In special cases a *limited* amount of credit may be given in subjects not catalogued as graduate studies where these are taken as minors and bear directly upon the major subjects and are recommended by the professor in charge of the major work and approved by the Dean.

7. Graduate students who are not candidates for an advanced degree are not required to designate a major or a minor subject but may elect their work with a view to their special purpose. Any course of study in the Graduate Division is open for election by such students upon the same conditions that are imposed upon those who are candidates for a degree. If at any time such special students desire to become candidates for an advanced degree, due consideration and credit will be given for work already done.

NOTE: Any deficiency in Modern Language should be made up immediately See requirements in Modern Language for advanced degrees

## DEGREES

The higher degrees conferred by the Iowa State College are the Master of Science and Doctor of Philosophy for advanced work in the technical fields especially developed at this college; and the Professional Degrees of Civil Engineer (C. E.), Electrical Engineer (E. E.), Mechanical Engineer (M. E.), Engineer of Mines (E. M.), Ceramic Engineer (Cer. E.), Chemical Engineer (Ch. E.), Agricultural Engineer (A. E.), Master of Agriculture (M. Agr.), and Master of Forestry (M. F.)

## THE MASTER'S DEGREE

The degree of Master of Science may be conferred upon students who have completed work in compliance with the following provisions and requirements:—

1. At least one year must be spent in resident work.

2. At least thirty credit hours or the equivalent must be completed, not less than half of which should be from this institution.

3. A minimum of twenty credit hours shall be completed in the major work, and a maximum of ten credit hours in the minor work. Minor work is recommended, and it may be taken in the same department in which the major is taken; but both major and minor may not be taken under the same instructor.

4. Major work may, upon special recommendation, be taken in two closely related subjects. In such a case a minor is optional.

5. A satisfactory reading knowledge of French or German must be certified to by the head of the Department of Modern Languages prior to admission to examination. Upon the recommendation of the head of the department some other modern language may be substituted for French or German.

6. Such subjects as are designated as "undergraduate and graduate" or "graduate" will be credited toward the advanced degree. Major work will ordinarily be restricted to graduate subjects. See 6 under Classification.

7. Examination shall be taken on all graduate work including thesis when thesis is required. This examination shall be oral or written as determined by the instructors concerned.

8. Thesis is optional with the department in which the major work is taken. When a thesis is required it should be written in conformity with the following rules:

a. The stock should be Brother Jonathan bond, 8½ x 11. If for any reason this stock is difficult to obtain, it is very desirable that the stock used approximate closely that which is recommended.

b. The right and left margins shall each be 1¼ inches. The top margin shall be 1½ inches and the bottom margin shall be 1¾ inches.

c. A specimen title page for the Master's thesis may be obtained at the office of the Dean of the Graduate Division.

## THE MASTER'S DEGREE PARTLY IN ABSENTIA

Any graduate of Iowa State College or other institution of high standing may be permitted to do one-half the required work for the Master's Degree *in absentia* as follows: 1. The applicant must be in residence at this institution during at least three six-weeks summer sessions. 2. During the period of two consecutive years while not in residence at the College the candidate must pursue a course of advanced study previously arranged by the head of the department in which the work is to be done and approved by the Dean of the Graduate Division. This *absentia* work is expected to equal in amount that normally accomplished in three six-weeks summer sessions and is to lie along the line of his major work. Such special students are required to pass examinations on all work done at the College and *in absentia*.

## ADVANCED STANDING

Graduate students of approved colleges and universities who have completed a portion of the requirements for the Master's or Doctor's degree in the technical lines developed at this institution, may be permitted to enroll as graduate students and finish their work for the desired degree. For the Master's degree at least one year of residence will be required, in which not less than fifteen credit hours of graduate work must be completed. For the Doctor's degree at least one year of residence will be required, in which not less than thirty credit hours of graduate work, inclusive of dissertation, must be completed.

## THE DOCTOR'S DEGREE.

The degree of Doctor of Philosophy may be conferred upon students who complete work in compliance with the following provisions and requirements:—

1. Three years of graduate work are required, one of which must be spent at this institution.
2. The degree will be conferred not solely as a result of faithful study over any period, but for ability to do research work of a scholarly character and for the successful passing of all examinations.
3 Major work shall be taken in one subject, or, in exceptional cases, in two closely related subjects. Two minors shall be taken when only one major is chosen, and one minor shall be taken when two majors are chosen.
4. Minor work shall represent from one-fourth to one-third of the work for the degree.
5. One minor must be taken outside the department in which the major is taken.
6. A reading knowledge of French and German must be certified to by the head of the Department of Modern Languages at least one year prior to final examination.

7. During the last two years of graduate work only such courses as are designated as "graduate" shall be credited on major work.

8. A thesis which is a real contribution to knowledge along some line in which the major is taken must be completed. The rules and regulations governing the printing of Doctors' theses follow:

a. The cover shall be identical in content with the title page.

b. The general format of the thesis is as follows: Dimensions of letter press should be approximately 4 x 6¾, to be printed on stock, the exterior dimensions of which should be 6 x 9, trimmed.

c. If the character of the material in the thesis is such as to require a larger page, then the dimensions of the letter press should be approximately 5½ x 7¾, to be printed on stock, the exterior dimensions of which should be 8½ x 11, trimmed.

d. The stock, or paper, on which the thesis is printed should be Coventry — Antique Finish Laid — Watermarked — 25 x 38 — 60 pounds — White.

e. If, for any reason, this stock should be difficult to obtain, it is desirable that the stock used approximate very closely that which has been recommended.

f. A sample of the standard title page may be obtained from the office of the Dean of the Graduate Division for the guidance of the printer. Any further details regarding the printing of the thesis should be secured from the Dean of the Graduate Division.

9. Not later than April 1st of the academic year in which the degree is sought, the candidate should have his thesis approved by the head of the department in which the major work has been taken, and submitted in typewritten form to the Dean of the Graduate Division. May 1st is the latest possible date for the presentation of the thesis.

10. Publication of the thesis by the candidate or by a scientific journal is required. In either case the degree will not be conferred until two typewritten copies of the thesis have been deposited in the library and a financial guarantee that fifty printed copies in approved form will also be deposited in the library. Reprints from standard journals are acceptable when printed in conformity with the above rules and regulations.

11. The Dean of the Graduate Division shall appoint for each candidate an examining committee composed of five members, including the professors in charge of the major and minor work, the chairman of which shall be the professor in charge of the student's major work. The Dean shall also designate the time and place for the examination, which may be either oral or written or both, over the fields of the major and first minor. In case a second minor is chosen, the examination over it may be waived if the candidate's standing in it is satisfactory.

## PROFESSIONAL DEGREES

Application for admission to candidacy for a professional degree in *Engineering* should be made to the Dean of Engineering prior to the be-

ginning of the second semester of the year in which the degree is sought. The requirements may be met in either of the two following ways.

1. Graduation from a regular four-year course in engineering, one year of resident study approved by the engineering faculty, at least one year of experience in a responsible professional position, and the preparation of a satisfactory thesis.

2. Graduation from a regular four-year course in engineering, at least five years of experience in a responsible professional position, and the preparation of a satisfactory thesis.

In *Agriculture and Engineering* the requirements for the degree of Agricultural Engineer are the same as those for the professional degrees in agriculture and engineering, and the candidate must be recommended by the faculties of both the Agricultural and Engineering Divisions.

In *Agriculture* the professional degree of Master of Agriculture is granted on the initiative of the faculty of the Division of Agriculture. The completion of a standard collegiate course in agriculture followed by not less than five years of eminently successful experience in some phase of practical or professional agriculture, and the presentation of an acceptable thesis are prerequisite.

It is the policy of the College to confer professional degrees only in cases of superior professional attainments, and then only on those who are present at Commencement.

## FELLOWSHIPS AND SCHOLARSHIPS

For the promotion of graduate study and research the Board of Education has established at Iowa State College a number of fellowships and scholarships. Application blanks may be obtained from the Dean of the Graduate Division, and when filled out should be filed in his office.

Scholarships are given to holders of a baccalaureate degree and carry with them a stipend of two hundred dollars payable in ten equal payments with the remission of tuition. All scholars pay a two dollars and fifty cents hospital fee, a fee of one dollar for each hour's work up to seven hours, and laboratory fees in their minor subjects only. Scholars are required to do at least three hours teaching a week or the equivalent

Teaching Fellowships are open to graduates of approved institutions and carry with them a stipend of four hundred dollars with the remission of tuition. Teaching Fellows are required to do at least five hours of teaching a week or its equivalent. The fees for Fellows are the same as those for Scholars.

Junior and Senior Research Fellowships are open to graduates of approved institutions and have for their object the encouragement of research work. Junior Research Fellowships may be held during the first year of graduate study and carry with them a stipend of three hundred dollars with the remission of tuition. Senior Research Fellowships carry with them a stipend of five hundred dollars and are ordinarily not awarded except to those who have had at least one year of graduate study or research experience. Research Fellows in the experiment stations shall

observe experiment station hours throughout the college year, except for the time given to minor work. The fees for all Fellows are the same as those for Scholars.

Full resident credit may be given for graduate work to holders of scholarships, and of teaching and research fellowships.

## GRADUATE STUDY BY MEMBERS OF STAFFS

The members of the instructional and investigational force of the rank of instructor or assistant are permitted to do graduate work. Those on half-time employment may receive not to exceed two-thirds time credit, and those on full time may receive not to exceed one-fourth time credit. All adjustments as to the amount of credit to be allowed shall be made between the Head of the Department in which the work is taken and the Dean of the Graduate Division.

Members of the Experiment Stations whose ranks correspond to that of instructors or assistants in the College may carry a limited amount of graduate work subject to the approval of the President.

## DEPARTMENTS OFFERING GRADUATE INSTRUCTION

### Agricultural Education

Professor Wilson; Associate Professors Sealock, Fisher

The department offers to graduate students minor work only, except in special cases when major work limited to technical agricultural subjects may be taken.

For description of studies, see page 85.

### Agricultural Engineering

Professor *Costelloe; Associate Professor Mervine

The department offers major work for the degree of Master of Science in Agricultural Engineering along the lines of farm machinery, farm power, drainage, irrigation, rural sanitation, and farm structures; and minor work for students selecting major work in other departments.

For the requirements for the professional degree of Agricultural Engineer and description of subjects, see pages 61 and 90.

### Animal Husbandry

Professors Pew, Bittenbender, Vaughan; Associate Professors Lloyd-Jones, Shearer, Ferrin, Ikeler, Evvard, Gillette; Instructor McCandlish

The department offers major and minor work for Master's degree along the lines of animal nutrition and feeding, animal breeding, live stock management, dairy husbandry, and poultry husbandry, and major and minor work for the Doctor's degree in nutrition, genetics, and dairy husbandry.

* Deceased January 12, 1918

The student who enters upon graduate work in animal husbandry must have, in addition to a Bachelor's degree, a general knowledge of zoology, inorganic and organic chemistry, and he must be qualified by training to undertake the special line of work which he elects. The major work must be selected from one of the above lines and a suitable thesis written. Minor subjects may be elected in this or another department.

For description of subjects, see page 105.

## Architectural Engineering and Rural Structures

Professor Allen Homes Kimball

The department offers major and minor work leading to the degree of Master of Science in Architectural Engineering.

For description of subjects, see pages 113 and 117.

## Bacteriology and Hygiene

Professors Buchanan, Brown, Hammer; Associate Professor Rice, Assistant Professor Levine

Major and minor work leading to the degrees of Master of Science and Doctor of Philosophy is offered in those phases of bacteriology which have important relations to agriculture, home economics, engineering, veterinary medicine, and the industries.

The student who elects his major in any field of bacteriology should present undergraduate credits in organic chemistry, one semester of physics, the equivalent of Course 1 in Bacteriology, and an elementary course in the line in which he expects to major. Ordinarily a student must do two-thirds of his work in one of the lines of bacteriology above mentioned.

For description of subjects, see page 119.

## Botany

Professor Pammel; Associate Professors Martin, Melhus, Bakke; Instructor Hayden

The department offers major and minor work for the degrees Master of Science and Doctor of Philosophy in those fields of Botany which find their application in agriculture, horticulture, forestry, and the industries. For this purpose graduate and research work in vegetable pathology, morphology, physiology, systematic and economic botany are offered.

Some of the research work receiving special attention at this time is alfalfa and clover pollination studies, the distribution of forest trees, transpiration of plants, honey plants of Iowa, rust investigations, fusarium disease of corn, crown gall, cabbage yellows, clover and alfalfa diseases, and corn root moulds.

For description of subjects, see page 125.

## Ceramics

Professors Beyer, Staley; Assistant Professor Galpin

The department offers major and minor work for the degree of Master of Science along the lines of ceramic technology of crude and fine clay products, the technology of glass and enamel making, the geology of clays and ceramic materials, microscopic study of clays, and ceramic materials and cement making.

For description of subjects and the professional degree of Ceramic Engineer see pages 136 and 61.

## Chemical Engineering

Professors Beyer, Coover; Associate Professor Mann

The department offers major and minor work for the Master's degree in any of the different lines of work in chemical engineering.

The Chemical and Engineering Departments are provided with facilities for investigation of manufacturing problems and for conducting industrial research according to a practical system of cooperation between science and industry. These facilities are open to graduate students in chemical engineering.

For the professional degree of Chemical Engineer and description of subjects see pages 61 and 140.

## Chemistry

College Department Staff: Professor Coover; Associate Professors Fowler, Test, Wilkinson, Renshaw, Mann; Assistant Professors Brown, O'Brien. Agricultural Experiment Station Staff: Acting Chief Gaessler. Engineering Experiment Station Staff: Chief Coye.

The Department of Chemistry offers major and minor work for the Master's and Doctor's degrees in those fields of chemistry applicable to agriculture, engineering, home economics, veterinary medicine, and the industries.

In the Agricultural Experiment Station thesis work is offered in agricultural and biological chemistry. In the Engineering Experiment Station thesis work is offered in industrial chemistry and the chemistry of road materials.

For description of subjects, see page 145.

## Civil Engineering

Professors Kirkham, King; Associate Professors Nichols, Crum, Dodds

The department offers major work for the degree of Master of Science in Civil Engineering along the lines of masonry structures and experimental engineering, railway engineering, structural engineering, hydraulic and sanitary engineering, masonry design, highway engineering; and minor and supporting work in the other departments of the Engineer-

ing, Agricultural, and Industrial Science Divisions. Students may therefore major in civil engineering and minor in any department of the Agricultural and Industrial Science Divisions which offers a correlated line of work, and vice versa.

For the professional degree of Civil Engineer and for the description of subjects, see pages 61 and 155

## Dairying

Professors Mortensen, Hammer; Associate Professor Rudnick; Assistant Professor Hauser

The Department of Dairying offers major and minor work for the Master's degree along the lines of management of dairy plants, dairy bacteriology, and creamery products. In correlation with the fundamental sciences the department also offers major and minor work for the Doctor's degree in management of dairy plants and dairy bacteriology.

For description of subjects, see page 167.

## Economic Science

APPLIED ECONOMICS AND SOCIAL SCIENCE

Professor Brindley; Associate Professors Von Tungeln and Rankin; Assistant Professor Peisch

The Department of Economic Science offers major and minor work for the Master's degree in those fields of Economic and Social Science applicable to agriculture, engineering, home economics, veterinary medicine, and the industries.

The special library facilities for graduate work in any of these lines together with the co-ordination of the work with the other divisions of the College are conducive to the best results in research work which is of vital interest to the state Research work involving rural social surveys may be carried on *in absentia* by those who are properly classified as graduate students.

For description of subjects, see page 171

## Electrical Engineering

Professor Fish; Associate Professors Bartholomew, Wright; Assistant Professors Robbins, Paine

The Department of Electrical Engineering offers opportunity for major work leading to the degree of Master of Science in Electrical Engineering. The subjects offered are advanced theory of alternating currents, electric power transmission, electric railways, and advanced work on the operating characteristics of electrical apparatus.

Opportunity for minor work is also given to those majoring in other departments of Engineering and in the departments of the Industrial Science and Agricultural Divisions.

For the requirements for the professional degree of Electrical Engineer and description of the studies see pages 61 and 177.

## Farm Crops and Soils

Professors Stevenson, Hughes, Brown; Associate Professors Smith, Potter, Bancroft, Eastman; Chief Burnett

Graduate work comprises investigations in the two general fields of soils and of farm crops. Major and minor work for the Master's degree is offered along the lines of crop production, crop breeding, soil physics, soil fertility, soil bacteriology, soil humus, and soil management. For the Doctor's degree, major and minor work is offered in soil fertility, soil bacteriology, and soil humus.

Research problems of great value to the state are carried on in each of the above lines by graduate students and members of the department faculty. Much interest is stimulated in such research by the meetings of the Iowa Section of the American Society of Agronomy which is composed of the graduate students of the department and the department faculty.

For description of subjects, see page 189.

## Farm Management

Professor Munger; Associate Professor Lloyd

Major and minor work for the Master's degree is offered in Farm Management. The problems which may be pursued include farm surveys, cost accounting, land tenure, and farm tenancy.

For description of subjects, see page 198.

## Forestry

Professors Beach, MacDonald; Associate Professor Morbeck

The department offers major and minor work leading to the degree Master of Science in Forestry. Also a five-year outlined course, developed along the lines of forest protection, forest management, lumbering, and forest products, and leading to the professional degree, Master of Forestry, is maintained for the special benefit of students who, at the beginning of their Freshman year, decide to spend five years in the study of Forestry.

Students who wish to become candidates for the degree Master of Science in Forestry must satisfy the entrance requirements to the Graduate Division and the requirements for a Master's degree as given on page 59.

For equipment and description of studies, see page 203.

## Geology

Professor Beyer; Assistant Professor Galpin

The department offers major and minor work for the Master's degree along those lines in which geology has an intimate relationship to mining engineering, soil formation, etc. The department also offers major work for the degree of Doctor of Philosophy in the fields of economic geology and petrology.

For equipment and description of subjects, see page 211.

## Home Economics

Professors MacKay, Miller; Associate Professors Gettemy, Monsch, Brandt, Fisher; Assistant Professors Humphreys, Olsen, Witwer, McNeal

Opportunities are offered for graduate study leading to the Master's degree in Home Economics. The major part of the graduate work is offered in the fields of chemistry, bacteriology, economic science, physiology, etc., which have special application to home economics. Each student, therefore, chooses her major graduate work in the particular field in which she wishes to specialize.

For description of subjects, see page 222.

## Horticulture

Professor Beach; Chiefs Erwin, Maney; Associate Professors Culley, Harrington; Assistant Professor Thurston; Instructor Stonecifer

The department offers major and minor work for the Master's degree along the lines of general horticulture, pomology, truck crops, landscape gardening, and floriculture; and major and minor work for the Doctor's degree along the lines of plant breeding and pomology.

For description of subjects, see page 235.

## Mathematics

Professors Stanton, Roberts; Associate Professors Colpitts, Pattengill, Chaney, Snedecor; Assistant Professor Tappan; Instructor Daniells

Major and minor work for the degree of Master of Science is offered by the department. Special courses in advanced mathematics of engineering, physics, economic problems, statistics, and biological problems are so correlated with the technical lines of work as to demand consideration of all students who expect to teach applied mathematics in technical institutions or to become investigators in any of the above lines of work.

For description of subjects, see page 254.

## Mechanical Engineering

Professor Meeker; Associate Professors Cleghorn, Major, Norman, Leavell

The department offers major work for the degree of Master of Science in Mechanical Engineering along the lines of gas engineering, steam engineering, heating and ventilation, machine designing, railway mechanical engineering, automobile engineering; and minor and supporting work in the other departments of the Engineering, Agricultural, and Industrial Science Divisions.

For the professional degree of Mechanical Engineer and description of subjects, see pages 61 and 261.

## Mining Engineering

Professor Beyer; Associate Professor Hodson

All of the subjects offered are required of undergraduates who specialize in Mining Engineering and Metallurgy, but may be elected for minor work by graduates who are majoring along other lines. The department does not, at the present time, offer major work for an advanced degree.

For the professional degree and description of subjects, see pages 61 and 277.

## Physics

Professor Spinney; Associate Professors Stiles, Thompson, Kunerth; Assistant Professor Plagge

The Department of Physics offers major and minor work leading to the degree of Master of Science in those fields of physics which are related to industrial science, engineering, home economics, and agriculture.

For equipment and description of subjects, see page 292.

## Veterinary Anatomy

Professor Howard Sylvester Murphey

Major and minor work for the degree of Master of Science is offered by the department in histology and in gross anatomy. Minor work in anatomy is suggested for students majoring in animal nutrition, biological chemistry, pathology, physiology, and zoology.

For equipment, specimen collection, and description of subjects see page 301.

## Veterinary Pathology and Bacteriology

Professor Dimock; Associate Professor Rice

The department offers major and minor work leading to the Master's degree along the lines of systemic pathology, the pathology of specific infectious diseases, the pathology of sporadic diseases, tumors, chemical pathology, veterinary bacteriology, immunity and serum therapy.

Students who major in veterinary bacteriology including immunity and serum therapy will classify with the Department of Bacteriology in the Industrial Science Division, but will do their work in the Department of Veterinary Pathology and Bacteriology. Students who major in pathology will classify in the Department of Veterinary Pathology and Bacteriology.

For description of subjects, see page 303.

## Veterinary Physiology and Pharmacology

Professor Henry Dale Bergman

The department offers major work for the Master's degree along lines of investigation of physiological subjects relating to veterinary science; and minor and supporting work in physiology for graduate students in the In-

dustrial Science Division, or for agricultural students who are doing their major work along such lines as general nutrition, production problems, feeding, breeding, etc

Students who major in physiology for an advanced degree must have had such previous training in physiology, and related subjects, as anatomy, histology, chemistry, etc., as will permit of advanced study.

For description of subjects, see page 306.

### Zoology

Professors Summers, Guthrie; Associate Professor Ewing; Assistant Professors Harrison, Scullen

The department offers major and minor work for the Master's degree along the lines of entomology, comparative physiology, invertebrate and vertebrate comparative anatomy; and major work for the Doctor's degree along the lines of entomology and comparative physiology.

For description of studies and equipment, see pages 315 and 313

## DEPARTMENTS OFFERING MINOR WORK ONLY

The work in the following departments is undergraduate in character and is subordinate and auxiliary to the work of the departments which offer major lines

### History

Professor Cessna; Associate Professor Schmidt

Students majoring for advanced degrees in agriculture or industrial science or applied economics and social science may minor in history. The chief purpose of this work is to furnish an historical foundation for the study of the present day economic and social problems in technical fields. The new trend in historical science has brought the study of history into a very fundamental relation to the industrial sciences.

For a statement of the nature of the work and description of studies, see page 213

### Psychology

Professor Cessna; Associate Professor Vance

Students majoring for advanced degrees in agriculture or industrial science or applied economics and social science may minor in psychology. It is evident that all subjects involving the human element must be based on the knowledge of the laws of mental action. The study of psychology is regarded as necessary to the proper understanding of such problems as industrial development and efficiency, rural social uplift, etc.

For a statement of the nature of the work and description of studies, see page 295.

# Division of Home Economics

DEAN MACKAY, Home Economics Building, Room 105

For tabulated courses and description of studies, see page 216.

The Division of Home Economics consists of the departments of Household Art, Household Science, and Physical Culture. It is the aim of the division so to coordinate the work of these departments with the other divisions of the College as to promote the highest possible scientific and technical training. The division is also in close cooperation with Agricultural Extension, under which the Home Economics extension work is conducted. The faculty of the division assists the extension workers in the preparation of bulletins and other materials. Capable students are sent out on extension work when possible.

The faculty is made up of the members of the departments within the Division of Home Economics and of voting representatives, to the number indicated, of the following departments in other divisions: Agricultural Education (1), Structure Design and Mechanical Engineering (1), Botany and Bacteriology (1), Chemistry (1), Zoology (1), History and Psychology (1), Modern Language and Economics (1), Physics and Mathematics (1), Public Speaking and English (1).

The division of Home Economics offers the following courses:

Four-year Courses:
- Household Art Group ... p. 218
- Household Science Group .p 217

Five-year Combined Course:
- Industrial Science and Home Economics .....p. 248

Four-year Combined Course
- Home Economics and Agriculture ..... .....p 219

(For graduate courses, see page 68)
(For non-collegiate courses, see page 345.)

**Beginning courses in Home Economics are offered in both semesters so that students may enter at the beginning of either semester.**

The first work in Domestic Economy offered in the Land Grant Colleges of the United States was given in the Iowa State College in the year 1869. The department was housed in various buildings on the campus until 1894, when laboratories were opened in the girls' domitory, Margaret Hall. In 1908 it was found necessary to secure larger quarters, and laboratories and class rooms were opened in Agricultual Engineering Hall. In 1911 a new Home Economics building was completed at a cost of $75,000. Here laboratories and class rooms have been equipped at a cost of $10,000. From the time of the opening of this build-

ing the attendance increased rapidly, and the division is now one of the largest of its kind in the country. Home Economics was organized as a separate division of the college in 1913.

The object of the courses in Home Economics is to teach the principles underlying the proper administration and management of the household, whether it be in the city, on the farm, or in institutions such as hospitals, dormitories, etc.; also to inquire into the hygienic, sanitary, and economic conditions affecting the home and the community, the social and economic status of women, the care of children, and many other problems of vital interest to home and community life.

The studies of the Home Economics Division may be classified under four groups:

A. **General and Cultural Subjects.** These include a course in English, ending with electives in journalistic work such as is needed by every writer for the news columns of our daily papers and monthly magazines. To this are added Literature, History, Modern Language, Mathematics, Physical Culture, and Public Speaking.

B. **Educational Subjects.** The courses require nine credits in Education and Psychology. Additional credits can be obtained by electing eleven hours of educational work. The nine required credits and the eleven elective credits will make a total of twenty credits required for the First Grade State Teachers' Certificate.

C. **Scientific Subjects.** A little over one-third of the time of the courses is given to related scientific work, including Botany, Bacteriology, General Zoology, and Economic Science. Courses in Chemistry are also required, including Inorganic and Organic Chemistry. Physiological or Textile Chemistry and Human Physiology are both given in the Junior year, in order that the student may be thoroughly prepared for the advanced work in Home Economics.

D. **Technical Subjects.** These cover about one-third of the courses. They are outlined in the two groups, Household Science and Household Art, and in the description of the studies of the Department of Home Economics, found on page 222.

**The courses** are planned to meet the needs of those who desire a good foundation in the study of subjects relating to the economic, scientific, and social problems of the home, of those who desire the work as part of a liberal education, of those who wish to teach in secondary schools or colleges, of those who wish to prepare themselves for other vocations in related lines of work, and of those who wish to undertake research work in the graduate school.

**Positions** open to graduates include teaching in secondary schools and colleges; county supervisorships; extension work; work of Home Demonstration Agents; social work in connection with settlements; dietetics work in hospitals; and the management of institutions. Home Economics graduates of the college are in constant demand; they are proving them-

selves strong teachers, lecturers, and extension workers, and are receiving good salaries.

**Honorary Society.** Gamma chapter of Omicron Nu was installed at Iowa State College April 28, 1913. Omicron Nu is the only national honorary fraternity for women in the country. It was established at Michigan Agricultural College in 1912. The object of the organization is to promote home economics education and scholarship among the students in Home Economics. The constitution is based upon those of Sigma Xi and Phi Beta Kappa, national societies to each of which women are admitted. The rapidity with which schools are accepting the honorary society shows the need which has been felt for some means of recognizing scholarship and high standards in home economics lines. Members are chosen from the Junior and Senior classes. In order to become a member one must show scholarship above the medium, with personality, initiative, executive ability, and capability in the chosen line of work.

**The Home Economics Club** has been organized for the students in the Division, and furnishes a forum for the discussion of subjects of general interest in Home Economics. Special lecturers are secured when possible, and the opportunity is given to hear speakers of national reputation in different lines relating to the work. All students in the division are eligible for membership.

**Practice Teaching.** Students who expect to teach have the privilege of conducting their practice teaching in the grade and high schools of Ames under the direct supervision of the superintendent of schools, and of the Agricultural Education and Home Economics departments. Each student is required to teach eighteen practice lessons. To supplement this work demonstrations are given by each student before typical audiences such as women's clubs, teachers' institutes, agricultural auxiliary societies, and other organizations.

**Practice Service.** In the Junior year students are required to plan, prepare, and serve typical meals as a climax to their work in the study of foods. The meals are served in a large dining room seating twenty-four to thirty guests. The buying and marketing is done by the students under the supervision of the instructor.

**Exhibits.** The exhibit committee of the Division arranges for exhibits of interest at various times throughout the year. The following have been secured: Consumers' League; Pottery, Art Department, General Federation of Women's Clubs; Industrial Exhibit and Modern Artists' Exhibit under the direction of Exhibits Department, Art Institute, Chicago; Industrial Arts Exhibit, Bonnie Snow, Chicago; School of Industrial Arts, Philadelphia; Etchings, by Ralph Pearson; Architectural Exhibits; Elson Art Exhibit; Berea College Handicraft Exhibit; American Association for Study and Prevention of Infant Mortality; American Medical Association Exhibit; Department exhibits of: Foods for the Sick; Foods for the Family; Conservation of wheat, meat, sugar, and fats; and special exhibits from other schools and colleges. At the

close of the college year an exhibit is given of the work done during the year by the students in the different departments. This includes the work in textiles, clothing, applied design, costume design, house plans, and schemes for house furnishing and decoration

**Equipment.** The Home Economics Building is of red compressed brick and of fire-proof structure. The heating is by both direct and indirect radiation; the entire amount of air in the building is changed every few minutes, thus providing perfect ventilation. The building is furnished and equipped with a view to utility, simplicity, and beauty.

The lecture rooms, locker rooms, and laundry room are situated on the first floor.

On the second floor are the Dean's office, general office, Home Economics extension office, and the faculty offices. Here also are the household art laboratories. Four large rooms are fitted up for sewing laboratories, and one for textiles. The sewing laboratories have fitting rooms opening from them, equipped with rugs, triple mirrors, single mirrors, small tables, and skirt markers. The laboratories are well equipped with machines, electric irons, wide tables suitable for drafting, demonstration frames, and cabinets for supplies. The sewing machines in the Junior laboratory have motor attachments. A large number of both adjustable and papier maché dress forms are a part of the general equipment. The textile laboratory contains exhibits of cotton, linen, flax, and different kinds of looms. A splendid collection of illustrative textile materials has been added for class instruction.

The Household Science rooms on the third floor, consisting of four large laboratories finished in white tile, marble, and enamel, accommodate eighty-four students at one time. Laboratories are fitted with individual gas stoves and gas, coal, wood, and electric ranges. Opening from each laboratory is a large pantry and dining room.

Laboratories equipped with individual adjustable drawing desks, work tables, and cabinets which contain reference books, pictures, and samples of materials, are available for work in applied design A number of good copies of celebrated paintings and plaster casts of famous pieces of sculpture have been added. A small reception room is also situated on this floor.

The heating, lighting, and ventilation of the building are thoroughly up-to-date. Large airy class rooms and laboratories make it possible to work with comfort and ease and contribute in no small measure to the "joy of work."

A demonstration laboratory for the use of students taking work in Practice Teaching is located in Margaret Hall.

A temporary building was erected near the Home Economics building originally to house chemistry classes until the new chemistry building was ready. This building is now used for the Home Economics classes in Applied Art, Costume Design, and Textile Design. It also has two rooms which are used for the corrective gymnastics work for women. It contains two large light class rooms, instructors' offices, and a store room.

It is well heated, lighted, and ventilated and affords excellent temporary quarters for classes.

The Home Economics Practice House is a new addition to the Division equipment. It is the purpose of the Division eventually to have a house erected on the campus. The house now in use is a seven-room cottage which has been rented by the college. It has been furnished and equipped to accommodate six students and the instructor in charge. The furnishings are simple and typical of the average American home. The purpose of the house is to provide an opportunity for students to gain practical experience in managing a household. The expenses of the house are met by a nominal charge made to students and instructor for board while in residence. The students are responsible for planning, preparing, and serving meals, marketing and household accounting, cleaning, and laundering of household linens.

# Division of Industrial Science

DEAN BUCHANAN, Science Building, Room 101

The faculty of the Division of Industrial Science is constituted as follows:—

1. Members of the instructing staff, of the rank of instructor or above, of the following departments administered within the Division of Industrial Science: Bacteriology and Hygiene, Botany, Chemical Engineering, Chemistry, Economics, English, History and Psychology, Library, Mathematics, Military Science and Tactics, Modern Language, Music, Physical Training, Public Speaking, and Zoology.

2. Members of the instructing staff, of the rank of instructor or above, of the following departments administered within other divisions: Geology, Physics, Veterinary Anatomy, Veterinary Pathology, and Veterinary Physiology.

3. Voting representatives (to the number indicated) from the following departments administered within other divisions: Agricultural Education (1), Agricultural Engineering (1), Agronomy (1), Animal Husbandry (1), Civil Engineering (1), Dairy (1), Electrical Engineering (1), Forestry (1), Home Economics (3), Horticulture (1), Mechanical Engineering (1), Mining Engineering (1).

The Division of Industrial Science offers the following courses:—

The Division of Industrial Science gives to every student in the institution a fundamental training in those sciences whose practical applications are largely worked out in the various courses of study. It has two important functions:—

First: To furnish instruction in the basic sciences and other fundamental subjects underlying the various industries and professions taught in the other departments and divisions of the institution. A large proportion of the work required in all technical courses must be taken within the departments of this Division. The subjects taught are therefore in a very real sense integral and essential parts of a technical education.

Second: To train men and women for efficient service in certain limited fields of professional and industrial science, especially those requiring support from strong technical courses such as form the main part of the efforts of this college. In this the Division carries out the clearly expressed provisions of the national land grant college law, or Morrill Act of 1862, which specifically states that scientific and classical studies and military tactics shall not be excluded from connection with the teaching of agriculture and mechanic arts; and also the later Morrill Act of 1890, providing an increase of the national appropriation for land grant colleges to be applied to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural, and economic sciences with special reference to their application in the industries of life.

In pursuance of the function first mentioned above, a serious attempt is made to relate all subjects taught within the Division to the more purely technical or professional subjects pursued in other divisions. The work is planned to make it most useful and helpful to the particular groups of students concerned.

To carry out the second purpose of the Division, courses in Industrial Science have been arranged to qualify the student to meet the requirements of certain industrial scientific work. The form in which they are presented has been determined by the requirements and suggestions of many specialists and professional men who are now occupying prominent positions in industrial science—men who are eminently fitted by experience to designate the necessary qualifications for their positions. The departments and subdepartments which offer such opportunity for specialization in Industrial Science are the following: Bacteriology and Hygiene, Beekeeping (Apiculture), Botany, Chemistry, Economics, Entomology, Geology, Mathematics, Military Science and Tactics, Physics, Plant Pathology, Veterinary Anatomy, Veterinary Pathology, Veterinary Physiology, and Zoology.

In addition, combined courses with Agriculture, with Engineering, with Home Economics, and with Veterinary Medicine are offered.

For discussions of major lines of work (subjects in which students may specialize) see the material under the departments mentioned above.

# Division of Veterinary Medicine

DEAN STANGE, Veterinary Building
*VICE-DEAN BEMIS, Veterinary Building

The Division of Veterinary Medicine offers the following courses:



The Division of Veterinary Medicine offers a four-year course leading to the degree of Doctor of Veterinary Medicine, and combined six-year courses with either the Division of Industrial Science or the Department of Animal Husbandry, and leading to both B Sc. and D. V. M. degrees. The Veterinary Division consists of five educational departments, the head of each department being a man of broad experience in the particular branches of medical science which the department represents.

The following departments are included in the Division:



The faculty of the Division of Veterinary Medicine consists of the Dean of the Division, together with the professors at the head of departments, the associate and assistant professors in the departments, and instructors. Representatives (to the number indicated) of the following departments outside of the Veterinary Division, in which the veterinary students do a part of their work, are considered members of the veterinary faculty: Chemistry (1), Botany (1), Animal Husbandry (1), Dairy (1), English and Economic Science (1), and Zoology (1).

Aside from the strictly educational departments in the Division, there are also the Department of Research in Animal Diseases and the State Biological Laboratory, both of which give the student rare opportunity to observe those phases of veterinary science in which these departments are engaged.

Aside from the facilities which belong especially to the Veterinary Division, the equipment for instruction in animal husbandry, consisting of large flocks and herds of carefully selected breeds of live stock, helps to render practical instruction very efficient. The most perfect types of the different breeds are used for class work. In this way the work in

* On leave of absence for Military Service

veterinary medicine is linked with that in agriculture, an arrangement which proves to be of inestimable value to veterinarians. The fact that the College is located in the richest live stock country in the world provides a rare opportunity for the veterinary student to study this phase of animal industry; it also enables him to observe a wealth of clinical cases both at the College Hospital, and under general practice conditions by means of the Ambulatory Clinic.

Work in Botany, Chemistry, Zoology, and other related sciences is adequately provided for in the special buildings for the accommodation of these several departments of college work. Each branch of study is presented to the student by a specialist.

The Freshman year has been arranged so as to enable students lacking entrance credits to take some additional work. During the Senior year opportunity will be given to take special work in certain subjects or to do some individual research work. The new buildings afford special facilities for this kind of work

Candidates for graduation must be twenty-one years of age, of good character, and must have passed examinations in all the required subjects in the course, to secure the degree of Doctor of Veterinary Medicine (D. V. M.). The student having completed the full course of instruction becomes a veterinarian in the broadest sense, and competent to enter a wide field of usefulness by any of the avenues enumerated:—

**General Practice:** In view of the fact that the national live stock valuation is estimated at $5,008,327,000, it becomes obvious that the graduate possessing fitness and aptitude for live stock work will meet with a ready demand and receive substantial compensation for his services.

**Bureau of Animal Industry:** Veterinarians are in demand for inspection work in the Bureau of Animal Industry, United States Department of Agriculture, at salaries ranging from $1,400 to $2,500.

**Army Veterinary Service:** Excellent opportunities are now offered to young veterinarians in the United States Army. The Army Veterinary Corps is organized as a part of the Medical Department of the Army, and army veterinarians receive the rank, pay, and allowances of commissioned army officers, entering with the rank of second lieutenant at $1,700 per year, and advancing at stated intervals to the rank of major with corresponding increases in salary and allowances These positions are very desirable, and include a wide range of professional work.

**Municipal and State Work:** Owing to the fact that the larger cities are rapidly inaugurating systems of milk and meat inspection, there is an increasing demand for competent veterinarians drilled in bacteriology and pathology. A large number of State positions are also open, on account of the rigid laws governing inter-state shipment of live stock which are being enacted by the various states.

**Sanitation:** The value of the educated veterinarian as a sanitarian is being recognized and positions are open in this field.

**Education and Research:** The demand for men capable of doing in-

vestigation work in animal diseases, associated work in connection with State Experiment Stations, and of filling various teaching positions in agricultural and veterinary colleges, has been greater than the supply.

**Commercial Work:** The lines of commercial work which demand trained veterinarians are increasing yearly. These include positions with railway companies, live stock concerns, in biological laboratories, pharmaceutical houses, etc. The demand for qualified veterinarians exceeds the supply, and many graduates go directly from college to positions paying $150 per month and upwards.

# Collegiate Departments of Instruction



**Definition of a Credit:** The amount of work in each study is expressed in credits, a credit meaning one recitation or its equivalent a week throughout the semester. It is considered that a one-hour recitation or lecture will require as much time including preparation as a three-hour laboratory, and therefore should be given the same credit. Any two-hour laboratory period is equivalent to two-thirds of a three-hour laboratory.

**Study Numbers:** In each department the studies, for convenience of reference, are given in numerical order. The summary of the description of the studies of each department shows the scientific group under

which the study should be classified, followed by the numbers belonging to that group.

## AGRICULTURAL EDUCATION

*Professor Wilson, Agricultural Hall, Room 318

Associate Professors Sealock, Fisher; Assistant Professor **Gibson; Extension Workers Bishop, Farrar, Bardwell

*For information concerning the Division of Agriculture, see page 45.*

The course in Agricultural Education is designed for students who expect to become teachers or supervisors of agriculture, home economics, or manual training and the related sciences. Students preparing to become high school teachers of agriculture need a general knowledge of agriculture but should plan specialization to the extent of at least 20 hours in technical agriculture in one particular field. Those preparing to teach in colleges require a greater amount of specialization. The course may be arranged to permit such specialization. Experience in placing graduates in teaching positions indicates that the large majority of those desiring to teach should vary the course sufficiently to teach satisfactorily at least three subjects in the high school. Students should consider this carefully in choosing electives. It is expected that during the sophomore year students in the course will confer with the head of the department with reference to elective courses.

Experience in practical farm work is a prerequisite to graduation in this as in other agricultural courses, except that women may substitute home economics for technical agriculture Credit for practical work may be secured to the extent of 4 semester hours Credit will also be given for the presentation of a satisfactory thesis. Any student entering the department with advanced credit will be expected to earn at least four credits in agricultural education before graduation.

The department is located on the upper floor of Agricultural Hall, occupying rooms 316 to 320. The equipment consists of an increasing list of library and general reference books relating to education, more especially to industrial and vocational phases of education Other facilities of the department for the training of teachers are the model school of the Summer Session and the opportunity for practice teaching in home economics and agriculture in the Ames Public Schools Such practice teaching facilities as can be provided will be furnished also in connection with our sub-collegiate courses.

Graduation from this course will entitle the student to a five-year first grade certificate in Iowa without examination It will also secure to the graduate a teacher's certificate in most other states of the Union.

For Teachers' Certificate see Index.

The demand for graduates of agricultural colleges to fill teaching positions is indicated by the fact that calls for teachers were received last

* Absent on leave during the fall semester, 1917
** Resigned December, 1917.

year from twenty-nine states and from foreign countries. No student having teaching as a major interest was disappointed in securing a satisfactory position. A total of 174 students were placed in teaching positions at a combined salary of over $139,000 The present salaries offered for graduates trained in agriculture, home economics, and manual training are considerably above the general average for teachers of other subjects. The demand for teachers has increased more rapidly than the supply.

## Course in Agricultural Education

Leading to the degree of Bachelor of Science in Agricultural Education.

NOTE: The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, and Horticulture are the same until the beginning of the Sophomore year.

In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97

FRESHMAN YEAR

| First Semester | Credits [2] | Second Semester | Credits |
|---|---|---|---|
| A H 1 Types and Market Classes of Beef Cattle and Sheep | 2 | A H 2· Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem 103 General Chemistry | 4 | Chem 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr 1 Corn Production | 2⅔ | Farm Cr 2 Small Grain | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib 1 Library Instruction (four hours for semester) | R[3] | Mil Sci 2 Military Art | 1 |
| *Math 17 Algebra and Trig | 3 | Phys Tr 2 Advanced Physical Training | R |
| Mil Sci 1 Military Art | 1 | Phys 205 Mechanics, Heat, and Light | 2⅔ |
| Phys Tr 1 Physical Training | R | | |
| | 18 | | 17⅓ |

* Freshmen who show deficient preparation in mathematics may be assigned, by the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above, and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies: —

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| Group 1 | | Group 2 | |
|---|---|---|---|
| Dairy 12· Farm Dairying | 2⅔ | A. E 1 or 2. Shop Work | 1 |
| Hort 3 General Horticulture | 2⅔ | Agr Engr. 29: The Graphic Method | ⅔ |
| | | Bot 161· Plant Morphology | 1⅔ |
| | | Forestry 1· Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-Year Collegiate Course in Agricultural Education see page 96

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81
[3] R indicates that the study is required, without credit, for graduation.

SOPHOMORE YEAR

| Third Semester | Credits [2] | Fourth Semester | Credits |
|---|---|---|---|
| Chem. 351 [1]: Applied Organic | 3⅔ | Engl. 19: Exposition | 3 |
| Engl. 18: Narration and Description | 3 | Mil. Sci. 4: Military Art | 1 |
| Mil. Sci. 3: Military Art | 1 | Phys. Tr. 4 or Phys. Cul. 4, 6 or 8 | R |
| Phys. Tr. 3 or Phys. Cul. 3, 5 or 7 | R | Psych. 8: Educational Psych. | 3 |
| Psych. 7: Outlines | 3 | Electives | 10 |
| Zool. 46: General Zoology | 3⅓ | | |
| Electives | 4⅓ | | |
| | 18⅓ | | 17 |

Electives suggested for third semester: A. H. 3 (3⅓), Farm Cr. 3 (2).
Electives suggested for fourth semester: A. H. 4 (3⅓), Chem. 352 (3⅓), L. A. 41, Dairy 13 (1⅔).

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Agr'l Ed. 1: Methods of Teaching the Vocational Subjects | 2 | Agr'l Ed. 2: Principles of Vocational Education | 2 |
| Bot. 124: Plant Embryogeny or Bot. 560: Botany of Weeds | 1⅔ | Soils 342: Soil Fertility | 3⅓ |
| Econ. Sc. 110: Agr'l Econ. | 3 | Farm Man. 2: Farm Management | 2⅔ |
| Soils 141: Soil Physics | 3⅓ | †Mil. Sci. 10: Military Art | 1 |
| †Mil. Sci. 9: Military Art | 1 | †Electives | 8 |
| † Choice: Agr'l Engr. 1 or 2 (1) and Electives (5) / Electives (6) (Note 4) | 6 | | |
| | 17[5] | | 17[5] |

Electives suggested for fifth semester: Agr'l Ed. 5a (2), Agr'l Jour. 8 (2), A. H. 42 (2⅔), M. E. 140 (1⅔).
Electives suggested for sixth semester: Agr'l Ed. 5b (2), Agr'l Jour. 9 (2), A. H. 43 (1), Bot. 268 (3⅓), M. E. 245 (1⅔), Engl 29 (2), Farm. Cr. 33 (2⅔).

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Agr'l Ed. 21a or 31a: Training in Teaching Agr. or H. Ec. | 3 | Agr'l Ed. 21b or 31b: Training in Teaching Agr. or H. Ec. | 3 |
| Pub. Sp. 10: Extempore Speech | 2 | Pub. Sp. 11: Extempore Speech | 2 |
| †Mil. Sci. 11: Military Art | 1 | †Mil. Sci. 12: Military Art | 1 |
| †Electives* | 11 | †Electives | 11** |
| | 17[5] | | 17[5] |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.
[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

* Electives suggested for seventh semester: Agr'l Jour. 5a (1), A. H. 20 (2), Agr'l Ed. 3a or 9a (2).

** Electives suggested for eighth semester: Agr'l Ed. 3b or 9b or 33 (2), Agr'l Engr. 5 (2⅔), Agr'l Engr. 21 (1), Econ. Sci. 424 (2), Hist. 24 (2), A. H. or Farm Cr. or Hort. (2 or 3).

NOTE 1. In the above course of study the student must complete, before graduation, forty credits in technical agriculture or home economics, thirty credits in science, fifteen credits in general culture work, fourteen credits in agricultural education, six credits in psychology, and thirty-five credits in free electives.

NOTE 2. Women students are encouraged to take the regular agricultural education course, because the demand for teachers is such as to justify their doing so. It appears, from discussion on page 282 of the Third Biennial Report of the Iowa State Board of Education, that there are a large number of women in Iowa who are successfully operating farms. Women have demonstrated their ability to teach any subject successfully when properly prepared. However, as most will want to substitute the home economics work for work in agriculture, they will be permitted to do so, and will be assisted by the heads of the departments of Home Economics and Agricultural Education to arrange a consistent group in home economics.

NOTE 3. Students intending to teach the following year will be permitted, with the consent of the dean of the division, to arrange an elective in education during the Sophomore year.

NOTE 4. Electives (6) to be taken by students who have had A. E. 1 and 2 in their Freshman year.

## Description of Studies

| Groups | Undergraduate and Graduate | Graduate |
|---|---|---|
| Fundamental Studies | 1, 2, 3, 5, 7, 8, 9, 25 | |
| Special Methods in Home Economics | 21 | |
| Special Methods in Agriculture | 31, 33 | |
| Research | | 20 |

1. **Methods of Teaching the Vocational Subjects.** The technique of the recitation; types of lessons and the standards for judging them; the selection and organization of vocational subject matter; the bases for readjusting the curriculum to make room for new types of school work; efficiency in the management of the study period.

5th, 6th, or 7th Sem. Recitations 2; credit 2.

2. **Principles of Vocational Education.** The biological, sociological, and psychological bases of education; aims and values in the curriculum, with particular reference to industrial and vocational subjects.

6th or 8th Sem. Recitations 2; credit 2.

3 a, b. **Development of the Industrial High School.** The sources and development of the high school curriculum, with particular reference to the industrial and vocational subjects. Organization, management.

Fall and Spring Sem. Recitations 2; credit 2, each sem.

5 a, b. **History of Vocational Education.** A phase of educational history of unusual value.

Fall and Spring Sem. Recitations 2; credit 2, each sem.

7. **Vocational Education.** Development and present best practice with reference to vocational education, pre-vocational education, and vocational guidance.

Recitations 2; credit 2. Offered in the Summer Session.

8. **Rural Education.** Reference to the interests of the county super-

intendent, the normal training teacher, and the superintendent or teacher in the consolidated or village school.

**Recitations 2; credit 2.**

9 a, b. **School Administration and Supervision.** Statistical and scientific methods applied to problems of education, with particular reference to the work of the principal and superintendent of the village or consolidated school.

**Fall and Spring Sem. Prerequisites 1 and 2; recitations 2; credit 2, each sem.**

20. **Research in Education.** The field of agricultural education supplies many problems for the advanced student of education. (a) Courses of study in Agriculture: The organization of Secondary Courses in Agriculture on a problem or vocational basis, and adapted to local conditions. (b) Vocational and Industrial Surveys: Surveys that will form an intelligent basis for the organization of vocational courses in agriculture and home economics.

PROFESSOR WILSON

**Hours by appointment.**

21 a, b **Training in Teaching Home Economics.** Same as Home Economics 21. Course of study, lesson plans, equipment and text books, history of the Home Economics movement, a minimum of eighteen lessons in observation and practice teaching in the public schools of Ames, demonstrations in foods, clothing, house planning, furnishing, etc., as adapted to various types of audiences

**6th and 7th or 7th and 8th Sem Prerequisite—completion of one semester of the Junior Year in Home Economics. Rec 2, lab 1 as arranged, credit, 3 each semester, fee $2 50.**

25a, b. **Observation.** Teaching methods through actual observation. May be taken along with, or following, 1 and 2 Observation is the laboratory part of these studies. The facilities at present are limited, so that classes must be limited to ten.

**Fall and Spring Sem. Conference, laboratory, and assignments 2 hrs.; credit 1, each sem.**

31 a, b **Training in Teaching Agriculture.** Courses of study; lesson plans; observation and practice teaching under supervision.

**7th and 8th Sem. Prerequisite 1 and 2, and agriculture equal to that required for the completion of Junior year in some agricultural course.**
**Recitation 2; lab. 1, 3 hr., credit 3, each sem**

33. **Methods of Agricultural Extension Teaching.** Designed to bring together in organized form the accumulated knowledge of the faculty on agricultural extension. It will plan to use the ability of various members of the Iowa State College staff who can give valuable help directly from experience in the organization of extension work, the preparation of material, adaptation to community demands, short courses, institutes, and other topics of interest to one preparing to enter the field of agricultural extension service.

**6th or 8th Sem. Recitations 2; credit 2**

42. **Training in Teaching Manual Training.** Course of study; lesson plans; observation and practice teaching under supervision; demonstrations.

8th Sem Recitations 2; lab 1, 3 hr; credit 3

## AGRICULTURAL ENGINEERING

(Administered jointly by the Dean of Agriculture and the Dean of Engineering.)

PROFESSOR *COSTELLOE, Agricultural Engineering Hall, Room 200

Associate Professor Mervine; Assistant Professor Kelley; Instructors Weeks, Carter; Fellow Stirniman; Extension Workers Hoffman, . . . .

*For information concerning the Division of Agriculture, see page 45; for the Division of Engineering, see page 50*

Agricultural Engineering is a grouping of subjects of an engineering nature which are closely related to agricultural interests It developed at Iowa State College as a phase of agronomy co-ordinate with crops and soils In 1906 it was recognized as a separate department and in 1909 a four-year course in agricultural engineering was established.

The department offers work in farm machinery, farm motors, farm buildings, drainage, irrigation and related subjects. Special courses are arranged to meet the needs of students of agriculture and engineering taking required work in this department.

The agricultural engineering course was provided to meet a demand for men with special training in agricultural engineering subjects. Ninety-four men have graduated from this course and they have taken up work along the following civilian lines. Farm machinery manufacture and sales; Farm building erection, manufacture and design; Drainage and Irrigation contracting, engineering and supervision; Highway engineering; Educational work in high schools, and College teaching, extension and experiment station work; Farming, Government technical work along agricultural engineering lines; Agricultural journalism and general engineering work

The work of the department is closely associated with the work of the Agricultural Engineering Section of the Agricultural Experiment Station. A separate staff devotes full time to investigational work and the results are available to support instructional and extension work. A very complete set of farm building plans which have been developed in co-operation with farmers has been made available in this way. Special agricultural engineering appliances have also been developed.

### Special Course for Engineering Students

The degree of Bachelor of Science in Agricultural Engineering (B. S. in A. E.) is given to students who have completed a four-year course

* Deceased January 12, 1918.

in civil, mechanical, or electrical engineering, followed by one year's prescribed work, approved by the faculty, in agricultural engineering and related sciences, under the rules and conditions governing work in other courses.

## Course in Agricultural Engineering

Leading to the degree of Bachelor of Science in Agricultural Engineering.

**Six months of practical work in Agriculture or Engineering under the direction of this department is required before graduation.**

FRESHMAN YEAR

| First Semester | Credits [2] | Second Semester | Credits |
|---|---|---|---|
| Agr'l Eng. 1[1] or 2: Shop Work | 1 | Agr'l Engr. 2 or 1: Shop Work | 1 |
| Agr'l Engr. 25: Technical Lecture | R[3] | Agr'l Engr. 26: Technical Lecture | R |
| Chem. 103: General Chemistry | 4 | *A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Engl. 18: Narration and Description | 3 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Engl. 19: Exposition | 3 |
| Math. 40: College Algebra | 3 | Math. 42b: Plane Trigonometry | 1 |
| Math. 41: Plane Trigonometry | 2 | Math. 43: Plane Analytic Geometry | 4 |
| M. E. 181: Mechanical Drawing | 1 | M. E. 220: Projective Drawing | 2 |
| Mil. Sci. 1: Military Art | 1 | Mil. Sci. 2: Military Art | 1 |
| Phys. Tr. 1 | R | Phys. Tr. 2 | R |
| | 17⅔ | | 18 |

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Agr'l Engr. 16: Farm Machinery | 3 | Agr'l Engr. 17: Farm Motors | 2 |
| Chem. 155: Quantitative Analysis | 2 | C. E. 486: Surveying | 3 |
| C. E. 304: Surveying | 3 | Math. 45: Calculus | 5 |
| Math. 44: Calculus | 5 | M. E. 401: Mechanics of Engineering | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: | R | Phys. Tr. 4: | R |
| Phys. 303: Mechanics and Heat | 5 | Phys. 404: Electricity and Magnetism, Light and Sound | 5 |
| | 19 | | 19 |

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.
[3] R indicates that the study is required, without credit, for graduation.
* Students with credit in A. H. 1 will not be required to have A. H. 2.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Agr'l Engr. 3: Advanced Shop Work | 1 | Agr'l Engr. 14: Seminar [4] | 1 |
| Agr'l Engr. 14: Seminar [4] | R | Agr'l Engr. 24: Farm Structures | 3 |
| Agr'l Engr. 18: Farm Motors | 2 | C. E. 653: Materials of Construction | 2 |
| Agr'l Engr. 19: Rural Sanitary Equipment | 1 | †**Dairy 12: Farm Dairying | 2⅔ |
| Hort. 1: General Horticulture | 2 | Farm Cr. 22: Small Grain and Forage Crops | 2⅔ |
| M. E. 502: Mechanics of Engineering | 5 | M. E. 613: Mechanical Laboratory | 1 |
| M. E. 512: Mechanical Laboratory | 1 | M. E. 660: Hydraulics | 3 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| Soils 141: Soil Physics | 3⅓ | Soils 342: Soil Fertility | 3⅓ |
| †Electives | 1 | | |
| | 17⅓[5] | | 19⅔[5] |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Agr'l Engr.15: Seminar [4] | R | Agr'l Engr. 11 or 12: Thesis | 3 or 5 |
| Agr'l Engr. 28: Irrigation | 2 | Agr'l Engr. 15: Seminar [4] | 1 |
| A. H. 20: Animal Feeding | 2 | Agr'l Engr. 27: Drainage Engineering | 3 |
| C. E. 612: Roads and Pavements | 2 | Engr. 801: History of Engineering | 1 |
| Econ. Sci. 110: Agricultural Economics | 3 | Farm Man. 2: Farm Management | 2⅔ |
| Engr. 702: Specifications and Contracts | 1 | †L. A. 43: Rural Landscape Design | ⅔ |
| Engl. 29: Literature of Farm and Community Life or Engl. 412: Argumentation | 2 | M. E. 533: Machine Work | 2 |
| L. A. 41: Rural Improvement | 2 | †Mil. Sci. 12: Military Art | 1 |
| †Hist. 20: Industrial History of the U. S. or Hist. 24: Econ. History of American Agriculture | 2 | †Electives | 2⅔ |
| †Mil. Sci. 11: Military Art | 1 | | |
| †Electives | 2 | | |
| | 19[5] | | 17-19 |

[4] The standing for the year's work will be recorded at the close of the spring semester.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Deans of Agriculture and Engineering.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

** Students who have credit for Dairy 12 may select 2 hours elective.

## Five-Year Course in Agricultural Engineering

(Omitted during the period of the war.)

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Farm Machinery | 5[1], 22 | 16 | |
| Farm Power | 23 | 13, 17, 18 | |
| Farm Structures | 6, 30 | 24, 38 | |
| Rural Sanitation | | 19, 36 | |
| Irrigation | 31 | 28 | |
| Drainage | 35, 37, 31 | 27 | |
| Shop Work | 1, 2, 3, 40, 41 | | |
| General Studies | 21, 23, 29, 25, 26, 14, 9, 15, 11, 12, 39 | | 34 |

1. **Shop Work.** Blacksmithing, forging and welding of iron and steel; making and tempering hand-tools. Work designed to be especially helpful in the repair and operation of machinery.

1st or 2nd Sem. Lab 1, 3 hr., credit 1, fee $2.50

2. **Shop Work.** Carpentry, care, use and sharpening of tools; laying off work; making of joints and framing. Work designed to be especially helpful in planning, framing, and construction of farm buildings.

1st or 2nd Sem. Lab. 1, 3 hr., credit 1, fee $2.50

3. **Advanced Shop Work.** Blacksmithing, horse shoeing, and plow work. Repair of castings, brazing, and autogenic welding

5th Sem. Lab. 1, 3 hr.; credit 1, fee, $2.50

5. **Farm Machinery and Farm Motors.** Mechanics and materials; the measurement and transmission of power; development, construction, functions, and methods of operating, adjusting, and repairing farm machinery and farm motors; the principles of draft and the production of power. Laboratory work is devoted to the study of construction, operation, adjustment, and testing of machines discussed in the class room.

3rd or 4th Sem. Prerequisite Phys 205, recitations 2, lab 1, 2 hr., credit 2⅔; fee $2.00.

6. **Farm Structures.** Planning of all farm buildings; a study of their construction, lighting, ventilation, cost, convenience; a study of the strength, durability, and cost of building materials; making of plans and specifications.

6th or 8th Sem. Prerequisite 29, recitation 1; lab 6 hr., credit 3

9. **Research Work.** Drainage, farm water supply, sewerage, road construction, farm structures, fences, use of cement on the farm, testing and calibrating various farm machines and traction tests.

5th, 6th, 7th or 8th Sem. Prerequisites 4 and 5, or 16 and 17, lab 3, 2 hr.; credit 2; fee $2.00

[1] The number refers to the description of the study

11. **Thesis.** Must be upon some subject requiring original work taken in agricultural engineering.

8th Sem. 9 hrs. work per week, credit 3.

12. **Thesis.** Same as 11.

7th or 8th Sem. 15 hrs. work per week; credit 5.

13. **Gas Engines and Tractors** Practical operation and management of the internal combustion engine. The development, the existing types, the theory and practice of operation; the adjustment, the repair, and the utility of gas, gasoline, oil, and alcohol engines. Laboratory work consists of tests and exercises to familiarize the student with the practical care and management of this type of motor.

5th, 6th, 7th, or 8th Sem Recitation 1; lab. 1, 3 hr., credit 2; fee $2 50.

14. **Seminar.**

5th and 6th Sem Recitation 1; credit 1.

15. **Seminar.**

7th and 8th Semester. Recitation 1; credit 1.

The Seminars (14 and 15) meet once each week and have for members the instructors and all Juniors and Seniors in Agricultural Engineering The work consists in the preparation, presentation, and discussion of papers on agricultural engineering subjects Papers are submitted to the professor in charge

16. **Farm Machinery.** Elements of machines; the measurement and transmission of power; the development, use, adjustment, construction, and repair of farm machinery

3rd Sem Prerequisites 1 and 2, recitations 2, lab 1, 3 hr., credit 3, fee $2 00.

17. **Farm Motors.** The production of power for agricultural purposes. The horse as a motor; tread and sweep powers; steam, gas, gasoline, oil and air engines, and tractors; windmills, electric power, as far as applicable to agricultural purposes.

4th Sem Prerequisite, Phys 303; recitation 1, lab 1, 3 hr., credit 2; fee $2.50.

18 **Farm Motors.** Continuation of 17.

5th Sem Prerequisites 17 and Physics 404, recitation 1, lab 1, 3 hr., credit 2; fee $2 50. (See study 5.)

19 **Rural Sanitary Equipment.** Lighting, heating, and ventilation systems for farm buildings Sanitary construction, plumbing, systems of water supply and sewage disposal. A E. 36 may accompany this as a laboratory

5th or 7th Sem Recitation 1, credit 1

21. **Cement Construction.** The use of cement in farm building construction. Cement testing study mixtures; construction of forms, reinforcement Also other building materials.

6th or 8th Sem. Recitation and lab. 1, 2 hr.; credit 1; fee $2 00.

22. **Mechanics and Machinery.** Planned especially for horticultural students, giving the development, construction, functions, and methods of operating, adjusting, and repairing spray machines and farm motors.

4th Sem. Recitations 2; lab 1, 4 hr. first half semester; credit 1⅔; fee $2 00.

23. **Dairy Engineering.** Management, care, and operation of steam and gasoline engines and refrigeration machinery. Laboratory work: practice and testing of boilers, engines, and accessories; plumbing, soldering, etc.

6th Sem. Recitations 2; lab. 2, 2 hr., credit 3⅓; fee $2 50.

24. **Farm Structures.** Similar to 6, but arranged for agricultural engineering and structure design students who have completed the Freshman and Sophomore years.

6th Sem. Prerequisite M. E. 401; recitation 1; lab. 6; credit 3.

25. **Technical Lecture.** General engineering and agricultural engineering subjects, in connection with the shop and other courses required. Includes the instruction given by the college librarian in the use of the catalogue system and reference books, and lectures by heads of engineering departments.

1st Sem. Lecture 1 hr.; required.

26. **Technical Lecture.** 25 continued.

2nd Sem. Lecture 1 hr.; required.

27. **Drainage Engineering.** The drainage of agricultural lands; drainage districts; reclamation by drainage works; flood control and the protection of overflowed lands; pumping; storage; analysis of hydrographic data. Laboratory work consists of surveys for and design of drainage systems. Investigations of the operation of drainage systems.

8th Sem. Prerequisites M. E. 660 or A. E. 37, C E. 486; recitations 2; lab. 1, 3 hr.; credit 3; fee $2.00.

28. **Irrigation.** The development of agriculture through drainage and irrigation; irrigation law, practice, methods; water rights; water requirements of crops; duty of water; seepage, return flow and underflow of rivers; supplemental water supplies. Pumping for irrigation.

7th Sem. Prerequisite 37 or Surveying, and Soils 141; recitations 2; credit 2.

29. **Graphic Methods.** Agricultural statistics and experimental data, including analysis, tabulation, plotting, and charting.

1st or 2nd Sem. Lecture and lab. 2 hr.; credit ⅔.

30. **Farm Structures.** The class work of 6. Sketches rather than finished drawings.

6th, 7th, or 8th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔.

31. **Drainage and Irrigation Engineering.** Irrigation: Water supply, storage, and distribution works; laws, maintenance and operation. Drainage: Principles of agricultural drainage; influence on crop production; reclamation of overflowed areas; levees; pumping, laws, organization of districts.

8th Sem. Lecture 2; credit 2.

34. **Agricultural Engineering.** Advanced work in drainage, irrigation, farm structures, farm power, or farm machinery. Ample facilities are available for advanced study and research.

ASSOCIATE PROFESSORS COSTELLOE, MERVINE

Open for major or minor subjects. Details of classification to be arranged. Proper fee for laboratory work chosen.

35. **Practical Work.** Under arrangements with the Iowa Highway Commission, the head of the department, and the Deans concerned, students may substitute from four to six weeks' work upon the state lake bed investigation, for elective credit.

Credit 2.

36. **Rural Sanitary Equipment Laboratory.** To accompany or follow A. E. 19. For agricultural students.

5th, 7th Sem. Lab. 1, 2 hr.; credit ⅔; fee $1.50.

37. **Agricultural Surveying.** Principles of land and drainage surveys. Agricultural drainage and drainage laws. Rural highways; irrigation; fences; drawing; lettering; making of drainage maps and profiles. Field work includes practice in use of surveying instruments and drainage surveys.

3rd or 4th Sem. Prerequisite A. E. 29; recitation 1; lecture and lab. 1, 3 hr.; credit 2⅔; fee $1.00.

38. **Farm Structures.** Construction, lighting, ventilation, cost, and convenience of farm buildings and their equipment; studies on special materials and their cost for special uses; preparing plans and specifications.

6th Sem. Prerequisite M. E. 401; recitation 1; lab. 1, 3 hr.; credit 2.

39. **Concrete.** Projects in concrete and the making of concrete forms. Emphasis upon actual operations and the acquisition of skill. Leading to definite plan for use in high school.

Summer Session 1917. Lab. 1, 3 hr.; credit 1; fee $2.00.

40. **Farm Repair Shop.** Elementary work in repair and construction for the farm; rope splicing, soldering, harness mending, grinding, sharpening, and care of tools. Making of complete plans for the construction and equipment of the farm repair shop.

Summer Session 1917. Lab. 1, 3 hr.; credit 1; fee $2.50.

41. **Advanced Forge Work.** The repair and care of agricultural equipment including plow share work, autogenic welding, forging of special farm equipment and tools. For prospective teachers.

2nd Sem. Lab. 1, 3 hr.; credit 1; fee $2.50.

## AGRICULTURAL JOURNALISM

PROFESSOR BECKMAN, Agricultural Hall, Room 16
Assistant Professors O'Brien, *Salt

*For information concerning the Division of Agriculture, see page 45.*

The instruction of this department is offered not only to students of the agricultural division, but to students of the home economics and engineering divisions as well, the studies being arranged and conducted to meet their special needs and each group having special classes.

These main purposes govern the instruction:

First, to give facility in the use of the news style of writing, which is valuable for vitality, interest, and effectiveness.

Second, to teach students how to write for the press and to give them some understanding of its standards, purposes and history so that, as farmers, teachers, experimentalists, or county agricultural agents, they may multiply their usefulness by contributing helpful and valuable news and information to newspapers, class and trade journals and magazines.

Third, to teach those students who want to follow agricultural or trade

* On leave of absence for Military Service.

journalism, or journalism in the rural field, some knowledge of its technical side and to give them practical training in its rudiments. The Iowa Agriculturist, a monthly magazine of high character, offers opportunity for this sorf of training, as does The Iowa Engineer. Further practical training may be secured on the staff of The Iowa State Student, a general college newspaper

The department was established in 1905 and has since been maintained with the generous aid of Mr John Clay of Chicago, a good friend of agricultural education and himself an able writer on agriculture. Mr. Clay and others believed that agriculture needs "practical men who have polished pens," as he expressed it, and that "the Book will help more than the Plow in the development of the new agriculture."

The department was the first of its kind. Its announcement in 1905 was received with no little question, both by educators and journalists. Now its worth stands justified in the opinions of both. One college after another, to the number of about thirty, has established similar work Every year agricultural publications come to this department seeking young men for responsible positions. Many of its former students are holding editorial positions or are gaining recognition as contributors.

The work of the department was enlarged in 1911 to give instruction to young women of the home economics division The year following, a course in agricultural advertising was added In the year 1913-14, instruction was provided for students in engineering as well as in agriculture As its work stands now, the department gives opportunity for a student in agriculture, home economics, or engineering to prepare for the field of specialized journalism.

The offices of this department, located on the ground floor of Agricultural Hall, main office, rooms 15, 16 and 17, are connected with the offices of The Iowa Agriculturist, with which the department is in close coöperation. Files of printing, advertising, agricultural publications and newspapers of Iowa are kept here. Here also, is the office of the editor of the Iowa Agricultural Experiment Station and of the information service for newspapers.

## Description of Studies

| Groups | Undergraduate | Undergraduate and and Graduate |
|---|---|---|
| Agricultural Journalism | 7[1], 20 | 5, 8, 9, 13, 14, 17, 18, 21 |
| Engineering Journalism | 8, 9 | |
| Journalism for Women | 5, 8, 9 | |

5 a, b. **Management of a Technical Journal** Given in connection with the making of the Iowa Agriculturist. The staff meets with the instructor to plan issues and to deal with management problems

7th and 8th Sem. Prerequisite 8, recitation 1; credit 1, each semester

7. **Agricultural Advertising.** A study of advertising applied to the selling of agricultural products. By lectures the principles of advertising are developed, and by planning and writing advertising copy, they are put

into practice. Each student establishes a hypothetical business for himself for which he plans and writes his advertising.

7th or 8th Sem. Recitation 1; credit 1.

8. **Beginning Technical Journalism.** The fundamentals of journalistic writing. Lectures on news, news values, and news style, with practice in news gathering and writing, and the application of the principles involved to agricultural, engineering, home economics, or other informational writing. Separate classes for agricultural, engineering, and home economics students.

5th, 6th, 7th, or 8th Sem. Prerequisites Engl. 116 and 117, or Engl. 18 and 19, or Engl. 220 and 221; recitations 2; credit 2.

9. **Technical Journalism Practice.** Devoted primarily to practice, following up the work in 8. Readiness in writing and the developing of originality and individuality are emphasized. Special attention is given to the longer feature and magazine article dealing with agriculture, engineering, or home economics. If possible, 18 should be taken in connection with this.

6th, 7th, or 8th Sem. Prerequisite 8; recitations 2; credit 2.

13. **Agricultural Publicity.** Open to students in Agricultural Education or Farm Management, or others who as agricultural advisers or extension workers will be able to make special use of local newspapers or other printed matter for educational and promotional purposes.

6th or 8th Sem. Prerequisite 8; recitations 2; credit 2.

14. **Editorial Writing for Farm Papers.** The structure and style of editorials and of the principles involved in editorial writing for farm papers. An analysis of the editorial pages of the better farm journals will be made. The writing will be agricultural in subject matter and tone.

7th Sem. Prerequisite 8; recitation 1; credit 1.

17. **The Rural Newspaper Field.** Designed for agricultural students who intend to work in the rural newspaper field, where the development of agricultural and other rural news is important. It includes a study of the relation of the rural newspaper to its agricultural constituency, of its duties to and opportunities in the rural districts, and of methods of management. Conducted in coöperation with other agricultural instruction.

7th Sem. Prerequisites 9 or 13; recitations 2; credit 2.

18. **History of Agricultural Journals.** A study of the development of the agricultural journals of America, with particular emphasis on the leading publications of the present time, their policies and aims. Individual investigation of agricultural journals supplements class lectures. Some attention is devoted to foreign farm papers. This subject should be taken with 9.

6th, 7th, 8th Sem. Prerequisite 8; recitation 1; credit 1.

19. **Practice in Copy Reading.** Assistance is given to the editorial staffs of student publications in preparing their copy for actual printing according to best newspaper and technical journal practice. The copy for these publications is edited under the direction of members of the depart-

ment. The course is open to others than members of student editorial staffs by special permission.

6th, 7th, 8th Sem. Prerequisites 8, 9; laboratory 3; credit 1.

20. **Practice News Writing.** Additional training and practice in writing news stories, offered especially to members of the staffs of student publications. Offered as an alternative to 9, and intended to help students get most effective results from their service on student publications.

6th, 7th, 8th Sem. Prerequisite 8; laboratory 3; credit 1.

21. **Bulletin Writing and Editing.** For the agricultural student who expects to go into experiment station or other lines of work which will necessitate the writing of reports, circulars or bulletins. Careful study is made of various types of publications issued from the agricultural experiment stations and the preparation of a manuscript for publication is required.

8th Sem. Prerequisites 8, 9; recitation 1; credit 1

## AGRICULTURE

DEAN CURTISS, Agricultural Hall, Room 124

*For information concerning the Division of Agriculture, see page 45.*

### Two-Year Collegiate Course in Agriculture

A two-year collegiate course in agriculture is offered to students qualified to enter the regular four-year college courses but not wishing to take more than two years of college work. This course is specially arranged for this class of students and meets their needs more satisfactorily than the non-collegiate course, which was established only for those who cannot meet regular college entrance requirements. Permission to enter the two-year collegiate course in agriculture must be secured from the dean of the division and the president of the college.

In the first year of the two-year collegiate course the student takes the work prescribed for freshmen in some one of the departments of the Division of Agriculture. In the second year he continues his study in a major branch, selecting his subjects with the approval of the head of the department concerned or the dean of the division. He may also elect such other subjects as meet the approval of the head of the department or the dean of the division, provided he can meet the standard prerequisites for that work, limited modifications thereof being granted. The minimum requirement for the two years is 70 credits. The schedule of the course for the entire year is to be made at the beginning of the year and placed on file with the dean.

On the satisfactory completion of two years of such work the student is granted a certificate giving evidence of that fact. If he decides later to return to complete a full four-year course, he shall receive credit toward his degree for the two-year work already completed.

Students who classify in the two-year collegiate course in agriculture shall be subject to the same rules that govern four-year collegiate students, as far as they may apply.

## Correspondence Study

To those unable to attend classes at the College, who wish to pursue work of a collegiate grade, the College offers correspondence work in the lines of agriculture listed below. This work makes possible the utilization of a student's leisure hours at home. He is given individual attention by the regular college instructors.

The work is open to those who have had the required preparation for admission to the college. See Admission.

A fee of $1.00 per credit hour is charged.

For further information address Dean C. F. Curtiss, Division of Agriculture, Ames, Iowa.

The following subjects (for full description see the respective departments) are offered:

| | | | |
|---|---|---|---|
| Agr'l Ed. 1: Methods of Teaching | 2 | Dairy 12: Farm Dairying | 2⅔* |
| Agr'l Ed. 3b: Development of the Industrial High School | 2 | Farm Cr. 1: Corn Production | 2⅔* |
| Agr'l Ed. 5: Educational History | 2 | Farm Cr. 2: Small Grain Production | 2⅔* |
| Agr'l Ed. 9a: School Administration and Supervision | 2 | For. 1: Farm Forestry | 2* |
| Agr'l Engr. 19: Rural Sanitary Equipment | 1 | Hort. 38: Plant Propagation | 2* |
| Laboratory work may be taken at the College (A. E. 36) | | Hort. 333: Truck Farming | 2* |
| A. H. 20: Animal Feeding | 2 | Soils 141: Soil Physics | 3⅓* |
| | | Soils 342: Soil Fertility | 3⅓* |

* Collegiate credit for the subject will be given only after the completion of laboratory work, which must be taken at the College.

## Practical Work

Administered by the head of the department in which the student elects to take the work.

Agricultural students who, by previous agreement with the head of the department, do practical work on farms, in horticultural, feeding, or breeding establishments, in beet sugar factories, or national or private forests of recognized standing, or in any kind of technical work which belongs to the division of agriculture, during their course of study, will be allowed credits on the following basis: Students who take practical work of the kind described under the direction of the proprietor and render competent and faithful service, will, on their return to college and on the presentation of a concise written report of their observations and experience, be entitled to credit for the work.

Students must have at least six months of practical work before graduation.

No credit in the college courses will be given for the first six months of practical work. This requirement should be met before the beginning of the junior year. Additional practical work will be credited as listed below.

## Description of Studies

| Groups | Undergraduate |
|---|---|
| Practical Work | 1[1], 2, 3 |

**1. Practical Work.**
**Six months required.**

**2. Additional Practical Work.**
**For three months in addition to 1; credit 2.**

**3. Additional Practical Work.**
**For three months in addition to 1 and 2; credit 2.**

## Course in Agriculture and Manual Training

A degree is awarded on the completion of the required work of this course.

The large number of calls upon this institution for teachers of Agriculture competent to teach manual training also, as shown by the Appointment Committee reports, has indicated clearly the desirability of offering a course of study to prepare men to teach the subjects of agriculture and manual training in consolidated schools and high schools. Any one completing this course will be entitled to the first grade state certificate without examination. The rapid growth of school consolidation in this state, as well as in all parts of the country, insures a constantly increasing demand for graduates with the preparation given by this course.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1[1]: Types and Market Classes of Beef Cattle and Sheep | 2 | Agr'l Engr. 41: Advanced Forge | 1 |
| Dairy 12: Farm Dairying | 2⅔ | Arch. E. 113: Working Drawings | 2 |
| Engl. 18: Narration and Description | 3 | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain Production | 2⅔ |
| Lib. 1: Library Instruction (four hours for semester) | R[3] | Engl. 116: Exposition | 3 |
| Math. 17: Algebra and Trigonometry | 3 | Math. 6: Solid Geometry | 2 |
| *M. E. 130: Forge Work | 2 | Math. 32: Analytical Geometry | 2 |
| M. E. 141: Vocational Drawing | 2 | M. E. 140: Manual Training | 1⅓ |
| Mil. Sci. 1: Military Art | 1 | M. E. 272: Elementary Mechanical Drawing | 1 |
| Phys. Tr. 1 | R | Mil. Sci. 2: Military Art | 1 |
| | | Phys. Tr. 2 | R |
| | 18⅓ | | 18 |

*** Students who prefer may substitute one credit hour of wood shop for one credit hour of forge shop work.**

**[1] The number refers to the description of the study.**
**[2] For definition of a credit, see page 81.**
**[3] R indicates that the study is required, without credit, for graduation.**

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| A. H. 3: Breed Studies of Beef Cattle and Sheep | 3⅓ | A. H. 4: Breed Studies of Dairy Cattle, Horses, and Swine | 3⅓ |
| Bot. 161: Plant Morphology | 1⅔ | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Chem. 103: General Chemistry | 4 | Farm. Cr. 33: Forage Crop Production | 2⅔ |
| Farm Cr. 3: Corn and Small Grain Judging | 2 | For. 1: Farm Forestry | 2 |
| M. E. 375: Applied Mathematics | 3 | Hort. 3: General Horticulture | 2⅔ |
| M. E. 382: Mechanical Drawing | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. 205: Mechanics, Light and Heat | 3 | Phys. Tr. 4: | R |
| Mil. Sci. 3: Military Art | 1 | Phys. 426: Electricity and Magnetism | 2 |
| Phys. Tr. 3: | R | | |
| | 19 | | 17⅔ |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| A. H. 42: General Poultry Husbandry | 2⅔ | Agr'l Ed. 2: Principles of Education | 2 |
| Agr'l Ed. 1: Methods of Teaching | 2 | A. H. 43: General Poultry Husbandry | 1 |
| Chem. 351: Applied Organic Chemistry | 3⅔ | Hort. 38: Plant Propagation | 2 |
| †E. E. 567: Small Electric Plants | 2 | †L. A. 41: Rural Improvement | 2 |
| M. E. 245: Vocational Woodwork | 1⅓ | M. E. 533: Machine Shop | 2 |
| †Mil. Sci. 9: Military Art | 1 | M. E. 671: Mechanics | 3 |
| Psych. 7: Outlines of Psychology | 3 | †Mil. Sci. 10: Military Art | 1 |
| Soils 141: Soils Physics | 3⅓ | Psych. 8: Educational Psychology | 3 |
| | | Soils 342: Soils Fertility | 3⅓ |
| | 19[5] | | 19⅓[5] |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Agr'l Ed. 7: Vocational Education | 2 | Agr'l Ed. 9b: School Administration and Supervision | 2 |
| Agr'l Ed. 31: Training in Teaching Agriculture | 3 | Agr'l Ed. 42: Training in Teaching Manual Training | 3 |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the classifying Dean.

| | | | |
|---|---|---|---|
| Agr'l Engr. 6: Farm Structures | 3 | Agr'l Engr. 5: Farm Machinery and Farm Motors | 2⅔ |
| †Econ. Sci. 110: Agricultural Economics | 3 | C. E. 865: History, Composition, and Uses of Concrete | 3 |
| Farm Man. 2: Farm Management | 2⅔ | Econ Sci. 424: Rural Sociology | 2 |
| †M. E. 773: Strength of Materials | 2 | †Mil. Sci 12: Military Art | 1 |
| M. E. 776: Repair Shop Work | 1 | †Electives | 6 |
| †Mil. Sci. 11: Military Art | 1 | | |
| †Electives | 2 | | |
| | 19⅔[5] | | 19⅔[5] |

## AGRONOMY

See "Farm Crops and Soils," page 185 )

## ANIMAL HUSBANDRY

Professor Pew, Agricultural Hall, Room 103

Professors Vaughan, Bittenbender; Associate Professors Ferrin, Shearer, Lloyd-Jones, Ikeler, Evvard, Gillette; Assistant Professor Rucker; Instructors Helser, Wylie, Miller; Fellows McBride, Heppe; Extension Workers Beresford, Cort, Coverdale, Lapp, Quaife, Richardson, and Lackie

*For information concerning the Division of Agriculture, see page 45.*

The department of Animal Husbandry offers instruction and carries on experimental work in the selection, breeding, feeding, care, and management of the various breeds and classes of farm animals, and in the killing, cutting, and curing of meats.

The work of the department is divided into three main groups, Animal Husbandry, Dairy Husbandry, and Poultry Husbandry. Students have the opportunity to make a choice of their line of work at the beginning of the junior year.

Because of the importance of the live-stock industry to the welfare of the state and because of the demand for instruction in this work, the equipment for instruction and experimental work has been made as complete in every detail as possible.

Graduates in Animal Husbandry find employment in many lines of work. A few of the many branches of work open to such graduates are: college work, experiment station work, government inspection and extension work, agricultural high school work, agricultural journalism with particular reference to live stock, stock farm management, sales positions with commission firms, buying for packing firms, selling animal feed stuffs manufactured by packing firms and by glucose, linseed, and cotton-seed oil companies.

† May be omitted by students appointed to the Reserve Officers' Training Corps For full information, see page 270

Some of the openings for graduates who have specialized in Dairy Husbandry are: college and experiment station work, positions in U. S. Department of Agriculture, extension work, dairy farm management, agricultural journalism work with particular reference to dairy cattle, management and sales positions with firms handling feed stuffs and dairy farm equipment.

For graduates trained in Poultry Husbandry, openings are found in government, college, and experiment station work, poultry judging, management of poultry supply houses and poultry fattening establishments, and sales positions with incubator and brooder manufacturers.

## Course in Animal Husbandry

Leading to the degree of Bachelor of Science in Animal Husbandry.

NOTE: The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, and Horticulture are the same until the beginning of the Sophomore year.

In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97.

FRESHMAN YEAR

| First Semester | Credits [2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1[1]: Types and Market Classes of Beef Cattle and Sheep | 2 | A. H. 2[1]: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib. 1: Library Instruction (four hours for semester) | R[3] | Mil. Sci. 2: Military Art | 1 |
| *Math 17: Algebra and Trig. | 3 | Phys. Tr. 2: Advanced Physical Training | R |
| Mil. Sci. 1: Military Art | 1 | Phys. 205: Mechanics, Heat, and Light | 2⅔ |
| Phys. Tr. 1: Physical Training | R | | |
| | 18 | | 17⅔ |

* Freshmen who show deficient preparation in mathematics may be assigned, by the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above; and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies: —

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| Group 1 | | Group 2 | |
|---|---|---|---|
| Dairy 12: Farm Dairying | 2⅔ | A. E. 1 or 2: Shop Work | 1 |
| Hort. 3: General Horticulture | 2⅔ | Agr. Engr. 29: The Graphic Method | ⅔ |
| | | Bot. 161: Plant Morphology | 1⅔ |
| | | For 1: Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-year Collegiate Course in Animal Husbandry, see page 96.

SOPHOMORE YEAR

| Third Semester | Credits [2] | Fourth Semester | Credits |
|---|---|---|---|
| A. H. 3[1]: Breed Studies of Beef Cattle and Sheep | 3⅓ | A. H. 4: Breed Studies of Dairy Cattle, Horses, and Swine | 3⅓ |
| A. H. 42: Poultry Husbandry | 2⅔ | A. H. 43: Poultry Husbandry | 1 |
| Agr'l Engr. 37: Agr'l Survey'g | 2⅔* | Agr'l Engr. 5: Farm Machinery and Farm Motors | 2⅔* |
| Chem. 351: Applied Organic | 3⅔ | Chem. 352: Agr'l Analysis | 3⅓ |
| Engl. 18: Narration and Description | 3 | Engl. 19: Exposition | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: Phys. Training | R[3] | Phys. Tr. 4: Phys. Training | R |
| Vet. Anat. 355: Anatomy of Domestic Animals | 3 | Zool. 52: General Zoology | 5 |
| | 19⅓ | | 19⅓ |

* These studies may be taken in the reverse order, Agr'l Engr. 5 in the third semester and Agr'l Engr. 37 in the fourth semester.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| A. H. 9: Animal Nutrition | 2 | A. H. 12: Feeding and Management of Live Stock | 2⅔ |
| Bact. 15: General Bacteriology | 3⅓ | Choice: Engl. 412: Argumentation; Engl. 29: Literature of Farm and Community Life | 2 |
| † Choice: Bot. 26: Ecology; Bot. 312: Common Plant Diseases (1⅔); Bot. 516: Poisonous Plants (2); Bot. 560: Botany of Weeds (1⅔) | 1⅔ or 2 | Choice: L. A. 41: Rural Improvement (2); Farm Cr. 33: Forage Crop Production (2⅔) | 2 or 2⅔ |
| Hist. 24: Economic History of American Agriculture | 2 | Genetics 2: General Genetics | 2 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| Soils 141: Soil Physics | 3⅓ | Soils 342: Soil Fertility | 3⅓ |
| Vet. Phys. 22: Comparative Physiology | 2 | Vet. Path. 744: Farm Sanitation and Communicable Diseases | 3 |
| Zool. 231: Embryology | 2⅔ | Choice: Agr'l Engr. 1 or 2 (1) and Electives (1); †Electives (2) | 2 |
| | 18 or 18⅓[5] | | 18 or 18⅔[5] |

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.
[3] R indicates that the study is required, without credit, for graduation.
[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

Students expecting to teach after graduation are urged to elect Ag. Ed. 1 and 2 during the Junior year. This will permit the work in practice teaching during the Senior year. See further details under Teachers' Certificates.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| A. H. 6: Advanced Judging | 1⅔ | ***A. H. 10: Thesis | 2 |
| **A. H. 8: Animal Breeding | 2 | A. H. 13, 14, 15, 16: Beef Production, Pork Production, Milk Production, Mutton and Wool Production | 4 |
| **A. H. 11: Feeding and Management of Live Stock | 2⅔ | A. H. 17: Feeding and Marketing of Horses | 1 |
| A. H. 22: Seminar | 1 | A. H. 23: Seminar | 1 |
| †Ec. Sc. 110: Agr'l Economics | 3 | *A. H. 30: Herd Book Study | 2⅔ |
| †Mil. Sci. 11: Military Art | 1 | †Mil. Sci. 12: Military Art | 1 |
| Soils 406: Soil Management | 2 | Vet. Surg. 17: Soundness and Shoeing | 2 |
| Vet. Surg. 19: Obstetrics | 1 | †Electives | 4⅓ |
| Zool. 308: Animal Parasites | 2 | | |
| †Electives | 1⅔ | | |
| | 18[5] | | 18[5] |

* A. H. 30 may be taken as an elective in the seventh semester. This would increase the electives in the eighth semester by 2⅔ credits.

** Class of 1919 will take A. H. 9 (2) in place of A. H. 8 and 11. This will increase the elective hours to 5⅓ in the seventh semester.

*** The student may substitute two hours of elective work in Animal Husbandry for A. H. 10.

## Dairy Husbandry Group

For Freshman and Sophomore years, see Animal Husbandry Course, page 101.

JUNIOR YEAR

| Fifth Semester | Credits [2] | Sixth Semester | Credits |
|---|---|---|---|
| A. H. 9: Animal Nutrition | 2 | A. H. 12: Feeding and Management of Live Stock | 2⅔ |
| Bact. 1: General Bacteriology | 4 | A. H. 60: Advanced Study of the Dairy Breeds | 3 |
| † Choice: Engl. 412: Argumentation (2) / Engl. 29: Literature of Farm and Community Life (2) | 2 | Dairy 13: Milk Testing and Inspection | 1⅔ |
| †Mil. Sci. 9: Military Art | 1 | Dairy 101: Dairy Bacteriology | 4 |
| Soils 141: Soil Physics | 3⅓ | †Mil. Sci. 10: Military Art | 1 |
| Vet. Phys. 22: Comparative Physiology | 2 | Genetics 2: General Genetics | 2 |
| Zool. 231: Embryology | 2⅔ | †Soils 342: Soil Fertility | 3⅓ |
| Choice: *Agr'l Engr. 1 or 2: Shop Work (1) / Electives 1 | 1 | | 18-18⅔ |
| | 18 | | 17⅔[5] |

* Agr'l Engr. 1 or 2 will not be required of students who had both Agr'l Engr. 1 and 2 in their Freshman year.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits |
|---|---|
| A. H. 6: Advanced Live Stock Judging | 1⅔ |
| **A. H. 8: Animal Breeding | 2 |
| **A. H. 11: Feeding and Management of Live Stock | 2⅔ |
| A. H. 58: Dairy Husbandry Seminar | 1 |
| Dairy 30. Market Milk | 1⅔ |
| †Hist. 24: Economic History of American Agriculture | 2 |
| †Mil. Sci. 11: Military Art | 1 |
| Soils 406: Soil Management | 2 |
| Vet. Surg. 19: Obstetrics | 1 |
| Zool. 308: Animal Parasites | 2 |
| †Electives | 1 |
| | 18[5] |

| Eighth Semester | Credits |
|---|---|
| †*A. H. 10: Thesis | 2 |
| A. H. 14: Pork Production | 1 |
| †A. H. 17· Feeding and Marketing of Horses | 1 |
| A H. 30: Herd Book Study | 2⅔ |
| A. H. 62: Milk Production and Herd Management | 3 |
| A H 61: Dairy Husbandry Seminar | 1 |
| Choice { L. A. 41: Rural Improvement (2) / Farm Cr. 33: Forage Crop Production (2⅔) } | 2 or 2⅔ |
| †Mil Sci. 12: Military Art | 1 |
| Vet. Path. 744: Farm Sanitation and Communicable Diseases | 3 |
| †Vet. Surg 17: Soundness and Shoeing | 2 |
| | 18⅔ or 19⅓[5] |

* A. H 10 may be taken as an elective in the seventh semester This will allow electives, 2 hrs., in the eighth semester

** Class of 1919 will take A H 9 (2) in place of A. H 8 and 11. This will increase the elective hours in the seventh semester to 4⅔

## Poultry Husbandry Group

For Freshman and Sophomore years see page 101.

JUNIOR YEAR

| Fifth Semester | Credits |
|---|---|
| A. H. 9: Animal Nutrition | 2 |
| A. H. 48· Advanced Poultry Judging | 2⅓ |
| Bact 15: General Bacteriology | 3⅓ |
| †Mil. Sci. 9: Military Art | 1 |
| Soils 141· Soil Physics | 3⅓ |
| Vet. Phys. 22: Comparative Physiology | 2 |
| Zool. 231: Embryology | 2⅔ |
| †Electives (1) / or / Agr'l Engr. 1 or 2: Shop Work (1) | 1 |
| | 17⅔[5] |

| Sixth Semester | Credits |
|---|---|
| A H. 51: Incubation | 2 |
| A H. 41: Brooding | 2 |
| Bact. 55: Special Poultry Bacteriology | 2⅓ |
| Genetics 2: General Genetics | 2 |
| †Mil. Sci. 10: Military Art | 1 |
| Soils 342: Soil Fertility | 3⅓ |
| Vet Path 744: Farm Sanitation and Communicable Diseases | 3 |
| †Electives | 2⅔ |
| | 18⅓[5] |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| **A. H. 8: Animal Breeding | 2 | A. H. 10: Thesis | 2 |
| A. H. 20: Animal Feeding | 2 | A. H. 49: Poultry Feeding | 2 |
| A. H. 50: Poultry Seminar | 1 | A. H. 54: Poultry Seminar | 1 |
| A. H. 53: Marketing of Poultry and Eggs | 2 | A. H. 55: Advanced Marketing of Poultry and Eggs | 2 |
| †Ec. Sci. 110: Agricultural Economics | 3 | A. H. 56: Poultry Research | 2 |
| †Mil. Sci. 11: Military Art | 1 | †Mil. Sci. 12: Military Art | 1 |
| Zool. 308: Animal Parasites | 2 | Vet. Path. 871: Poultry Parasites, Diseases and Hygiene | 2 |
| Hort. 102: Commercial Orcharding | 2 | †Electives | 5 |
| †Electives | 3 | | |
| | 18 | | 17 |

** Class of 1919 will take A. H. 9 (2) in place of A. H. 8.

## Combined Course in Animal Husbandry and Veterinary Medicine

For statement, see page 300.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Types, Market Classes, and Judging | 1[1], 2, 26, 27 | 35 | |
| Breed Studies and Judging | 3, 4 | 32 | |
| Advanced Judging | | 6, 25 | |
| Nutrition and Feeding | | 9, 13, 14, 16, 17 | |
| | | 20, 28 | 66 |
| Animal Breeding | 21 | 8, 29, 30 | 65 |
| Live Stock Management | | 11, 12 | |
| Meats | | 36 | |
| Thesis and Seminar | 10 | 22, 23 | |
| Poultry Husbandry | 42, 43, 45 | 41, 48, 49, 50, 51, | |
| | | 53, 54, 55, 56 | 68 |
| Dairy Husbandry | | 15, 58, 60, 61, 62 | 67 |

1. **Types and Market Classes of Beef Cattle and Sheep.** Judging; study of carcasses, live stock markets, and the market classification of live stock.

1st Sem. Recitation 1; lab. 3 hr.; credit 2; fee $1.50.

[1] The number refers to the description of the study.

[2] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

2. **Types and Market Classes of Dairy Cattle, Horses, and Swine.** Judging; study of carcasses, live stock markets, and market classification of live stock.

2nd Sem. Recitation 1; lab. 3 hr.; credit 2; fee $1.50.

3. **Breed Studies of Beef Cattle and Sheep.** Judging types and representatives of different breeds according to their official standards; study of the origin, history, characteristics, and adaptability of the breeds.

3rd Sem. Prerequisite 1; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $2.00.

4. **Breed Studies of Dairy Cattle, Horses, and Swine.** Judging types and representatives of different breeds according to their official standards; study of the origin, history, characteristics, and adaptability of the breeds.

4th Sem. Prerequisite 2; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $2.00.

6. **Advanced Live Stock Judging.** The judging of horses, cattle, sheep, and swine in groups for Senior Animal Husbandry students.

7th Sem. Prerequisites 3, 4, and Vet. Anat. 355; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

8. **Animal Breeding.** Application of the principles of Genetics to the improvement of domesticated live stock, related phases of reproduction bearing on the breeding industry and approved methods of practice.

7th Sem. Prerequisites 3, 4 and Genetics 2; lectures 2; credit 2.

9. **Animal Nutrition.** The materials and processes of nutrition and feed requirements for different purposes. Nutritive ratios and feeding standards.

5th Sem. Prerequisites Chem. 351 and 352. Prerequisite or required with this course Vet. Phys. 22; lectures 2; credit 2.

10. **Thesis.** Advance work in some special phase of Animal Husbandry. The subject is chosen by the student, approved by the head of the department, and worked out in consultation with an instructor.

8th Sem. Laboratory 6 hrs.; credit 2.

11. **Feeding and Management of Live Stock.** The practical feeding and management, and the fitting for show or sale, of beef cattle, dairy cattle, and sheep.

7th Sem. Prerequisite 12; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $2.00.

12. **Feeding and Management of Live Stock.** Feed stuffs and animal feeding. The practical feeding and management, and the fitting for show or sale, of horses and hogs.

6th Sem. Prerequisite 9 and Chem. 351 and 352; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $2.00.

13. **Beef Production.** Problems in production for market purposes.

8th Sem. Prerequisites 9, 12, and Zool. 308; recitations 5, for first four weeks; credit 1.

14. **Pork Production.** Problems in production for market purposes.

8th Sem. Prerequisites same as 13; recitations 5, for four weeks following 13; credit 1.

15. **Milk Production.** The evolution of dairy feeding standards. Feed stuffs and methods of preparing and feeding as related to the most economical production of milk.

8th Sem. Prerequisites 9, 12, and Zool. 308; recitations 5, for four weeks; credit 1.

16. **Mutton and Wool Production.** Problems in production for market purposes.

8th Sem. Prerequsiites same as 13; recitations 5, for four weeks following 15; credit 1.

17. **Feeding and Marketing of Horses.** Problems.

8th Sem. Prerequisites same as 15, recitations 5, for four weeks following 16; credit 1.

20. **Animal Feeding.** Similar to 28, but less comprehensive.

5th or 7th Sem. Prerequisite Chem. 351, or 408; recitations 2; credit 2.

21. **Principles of Breeding.** Similar in content to 8 but less comprehensive in scope and less technical in nature.

5th or 7th Sem. Prerequisites 1 and 2; lectures 2; credit 2.

22. **Seminar.**

7th Sem. Credit 1.

23. **Seminar.**

8th Sem. Credit 1.

25. **Live Stock Judging.** The judging of horses, cattle, sheep, and swine in groups for Junior Animal Husbandry students.

Either Sem. Prerequisites 3, 4, Zool. 52, Vet. Anat. 355; recitation and labs. 2, 1 hr.; credit 1; fee $1.00.

26. **Market and Breed Types of Beef Cattle and Sheep.** Judging of market types; breed types, and representatives of the several breeds of beef cattle and sheep. For Vet. students.

1st Sem. Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

27. **Market and Breed Types of Dairy Cattle, Horses, and Swine.** Judging of market types, breed types, and representatives of the several breeds of dairy cattle, horses, and swine. For Vet. students.

2nd Sem. Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

28. **Animal Feeding.** The digestion of food; composition and digestibility of feeding stuffs; preparation of feeds; feeding standards and the calculation of rations; the feeding of horses, beef and dairy cattle, sheep, and swine. For Agronomy students.

6th or 8th Sem. Prerequisite Chem. 351; lectures 3; credit 3.

29. **Ancestry of Domestic Mammals.** Forces which have caused a progressive evolution from the primitive hoofed mammals to the domestic mammals of today. The teeth and skeletal modifications, environmental adaptations, family and species relationships, and the particularized effects of domestication.

6th or 8th Sem. Prerequisite 8 or 21; recitation 2; credit 2.

30. **Herd-Book Study.** Lectures on pedigrees, blood-lines, families, and tribes, in the various breeds of live stock; laboratory in working out pedigrees from the herd books.

7th or 8th Sem. Prerequisites 3, 4, and Vet. Anat. 355; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.00.

32. **Advanced Studies of the Breeds of Beef Cattle.** Origin, development, and characteristics of the breeds of beef cattle.

6th or 8th Sem. Prerequisites 3 and Vet. Anat. 355; lectures 2; credit 2; fee $1.00.

35. **Market Classes and Grades of Live Stock.** Laboratory work in classifying, grading, and valuing horses, cattle, sheep, and swine from the standpoint of the open market.

5th or 7th Sem. Prerequisites 1, 2, and Vet. Anat. 355; recitation ½; lab. 1, 1½; credit 1; fee $1.00.

36. **Farm Meats.** Killing, cutting, and curing of farm meats.

8th Sem. Prerequisites 11 and 12, recitation 1; lab 1, 3 hr; credit 2; fee $2.00.

41. **Brooding.** The principles and practice of brooding.

6th or 8th Sem. Prerequisite 51; recitations 2 for last 3 weeks of semester; lab. 4 weeks, 1 hr. daily divided into 3 periods; credit 2; fee $2 00.

42. **General Poultry Husbandry.** Various kinds of poultry products ordinarily produced for sale, with reference to their relative importance and opportunities for their production; characteristics of important classes and breeds of poultry; judging, breeding, housing, diseases, sanitation, and marketing.

3rd Sem Recitations 2; lab 1, 2 hr.; credit 2⅔, fee $2.00.

43. **General Poultry Husbandry.** Continues the work in 42 and includes feeding, incubation, and brooding.

4th Sem. Prerequisite 42; recitations and lab 2 hr, credit 1; fee $2 00.

45. **Poultry Management.** For women. General care and management of poultry from the standpoint of home economic students.

Spring Sem. Prerequisites Chem 103 and 110, recitation and lab 1, 2 hr; credit 1.

48. **Advanced Poultry Judging.** History and development of the more important breeds and varieties of poultry, and practical work in judging both by score card and comparison.

5th Sem. Prerequisite 43; recitation 1; lab 2, 2 hr.; credit 2⅓; fee $2 00.

49. **Poultry Feeding.** Practical and experimental work; series of lectures on the important factors involved in the making up of poultry rations for various classes of poultry and in feeding for various purposes, particularly that of egg production, development of young stock, and meat production.

8th Sem. Prerequisite 43, lectures 1; lab. 1, 3 hr.; credit 2.

50. **Poultry Seminar.**

7th Sem. Credit 1.

51. **Incubation.** Successful hatching of eggs, including those factors which influence the hatching quality before as well as during the incubation period. General methods in vogue in the management of central or mammoth hatcheries and the distribution of baby chicks. Laboratory includes practical and experimental work in incubation.

6th Sem. Prerequisite 43; recitations 2 for first 12 weeks; lab. 4 weeks, 1 hr daily divided into 3 periods; credit 2; fee $2 00.

53. **Marketing of Poultry and Eggs.** Lectures on egg and poultry markets. Laboratory in the practical work of selecting, fattening, picking, and packing poultry for shipment to eastern markets, and in grading and shipping eggs.

7th Sem. Prerequisite 43; recitations 1½, lab 1, 1½ hr; credit 2; fee $2.00.

54. **Poultry Seminar.**
8th Sem. Credit 1.

55. **Advanced Marketing of Poultry and Eggs.** Lectures on market conditions. Laboratory in the practical work of candling, grading and preparing eggs for shipment to eastern markets.
8th Sem. Prerequisite 53; recitations 1½; lab. 1, 1½ hr.; credit 2; fee $2.00.

56. **Poultry Research.** Experimentation and study of special poultry problems. Approved methods and technique as well as practical research work.
8th Sem. Prerequisite 43; labs. 3, 3 hr; credit 2; fee $2.00.

58. **Dairy Husbandry Seminar.** Papers on selected subjects and recent investigations.
7th Sem. Credit 1.

60 **Advanced Study of the Dairy Breeds.** Origin, history, and characteristics of the important strains and families of each of the dairy breeds.
6th Sem. Prerequisite 4; recitation 2; lab. 1, 2 hr., and 1, 1 hr.; credit 3; fee $1 00.

61. **Seminar. Problems in Milk Production and Herd Management.** Weekly conferences in which current events and recent experimental work and special problems will be discussed. Special problems will be assigned for research work also. For Dairy Husbandry students.
8th Sem. Credit 1 hr.

62. **Milk Production and Herd Management.** Efficient and economical production of milk and the practical care, feeding, housing, and management of dairy cattle.
8th Sem. Prerequisite 9 or 20; recitations 2; credit 3.

65. **Research in Animal Breeding.** Heredity and its related problems offer a large field for experimental research. Associate Professor Lloyd-Jones.
Credit 3 to 10 hours per semester.

66. **Advanced Animal Nutrition.** Feeding, care, and management of live stock; especial emphasis being placed on the study of experimental methods and of research work previously done. Practical and fundamental problems will be worked out. Practical laboratories and lectures are given.

Professor Pew; Associate Professors Ikeler, Shearer, Evvard
Credit 3 to 10 hours per semester.

67. **Research in Dairy Husbandry.** Advanced study of the dairy breeds; milk production and herd management. Professor Gillette
Credit 3 to 10 hours per semester.

68. **Research in Poultry Husbandry.** Incubation, brooding, feeding, breeding, marketing and study of the principles and practices of successful management of flocks Professor Bittenbender
Credit 3 to 10 hours per semester.

## ARCHITECTURAL ENGINEERING AND RURAL STRUCTURES

PROFESSOR KIMBALL, Engineering Hall, Room 407
Instructor Sprague

*For information concerning the Division of Engineering, see page 50.*

The department offers work in two distinct fields, Architectural Engineering and Rural Structures. The course in Architectural Engineering leads to the degree of B. S. in Architectural Engineering, while that in Rural Structure Design leads to a Two-year Collegiate Certificate. The demand for instruction along the lines of work in this department has been gradually growing. As indicated above, the work follows the line of two separate options. Men following either of these options will find a distinct field of professional work which has been partially developed heretofore.

The courses are so planned as to give the graduate the best possible training along the lines mentioned above. Advanced subjects are offered for such students as desire to qualify for the work. Men graduating from the courses are fitted for government or private employ as Architectural Engineers and experts in Rural Structures. The Architectural Engineering branch prepares its graduates to become skilled draftsmen in any line of building or construction activity, as well as to serve in the position of building inspectors or superintendents, or to become general contractors and consulting architectural engineers.

Students have already classified in such large numbers for the course heretofore given that the College finds it necessary to limit admission to those seriously designing to practice, after leaving college, in the exact lines of work described above.

Neither of the following options prepares men to practice architecture.

**Option I. Architectural Engineering.** The purpose of the Architectural Engineering course is to give a thorough training in the fundamentals of engineering problems found in connection with architectural work and a knowledge of the aesthetic treatment of engineering structures. Only so much Architectural Design is included in this course as is required to promote the correct development of the engineering work, and not sufficient to qualify for the practice of architecture.

The work in the first and second years of the course gives the student the fundamentals of instruction in general chemistry, mathematics, physics, working drawings, freehand drawing, and elements of architectural design. In the third and fourth years of the course a maximum amount of the time is spent in the study of problems in steel and reinforced concrete construction, practice in testing materials in the cement and masonry laboratories, heating and ventilating design, fireproof construction, and the elements of estimating, electric wiring, and public sanitation. These subjects cover the fundamentals offered and present many interesting problems for the student of Architectural Engineering.

**Option II. Rural Structure Design.** Rural Structure Design com-

prehends the design and construction of types of farm buildings: namely, rural structures consisting of the usual and necessary buildings on farms, or in rural communities, their arrangement and grouping, sanitation and drainage. Such problems are treated from three standpoints: namely, practical planning, economic use of materials and aesthetic treatment of design. The work in the first and second semesters gives the student fundamental instruction in mathematics, English, chemistry, and surveying. Parallel with the work in the exact sciences the student spends a great deal of his time on freehand drawing and elementary rural design. By this method he becomes familiar with the necessary means of expression and his eye becomes trained to proper and true proportions, which are fundamental in design. In the third and fourth semesters the work covers subjects such as mechanics, mathematics, physics, agricultural engineering, rural structures, specifications and estimating, landscape gardening, sanitation, and freehand drawing.

**Equipment.** The general offices and drafting rooms of the department are located on the fourth floor of the Engineering Hall. The department shares one lecture room on the third floor with other departments, as well as the use of the general assembly room on the second floor and the Engineering Library on the third floor. The drafting rooms are furnished with combination drafting tables, each accommodating two men at a time. The department has a good collection of plaster casts for free-hand drawing work, a large collection of blue-prints of existing structures, and a library of several hundred engineering and architectural catalogues available for class work. There is also a large collection of lantern slides used in connection with the work in History of Architecture. These consist of pictures of buildings both in this country and abroad and form a valuable part of class-room work. In addition to drafting room equipment the department possesses many fine books on building construction and design. This collection is being increased as rapidly as possible from the funds available. On account of lack of text books along the lines given in this course it is necessary to present much of the material in mimeograph form and so supply the students with information available in no other way. The department wishes to be of service to the building interests of the State of Iowa, as well as to all those who are interested in building construction. To this end, correspondence is solicited and information will be freely given at any time.

## Course in Architectural Engineering

Leading to Degree of Bachelor of Science in Architectural Engineering.

FRESHMAN YEAR

| First Semester | Credits [2] | Second Semester | Credits |
|---|---|---|---|
| Arch. E. 101: Tech. Lecture | R[3] | Arch. E. 202: Tech. Lecture | R |
| Arch. E. 113: Working Drawings | 2 | Arch. E. 212: Freehand Drawing | 2 |
| Chem. 111: General Chemistry | 5 | Arch. E. 215: Working Drawings | 2 |

| | |
|---|---|
| C. E. 101: Freehand Lettering | 1 |
| Engl. 116: Exposition | 4 |
| Math. 40: College Algebra | 3 |
| Math. 41: Plane Trig. | 2 |
| Mil. Sci. 1: Military Art | 1 |
| Phys. Tr. 1: | R[3] |
| | 18 |

| | |
|---|---|
| C. E. 264: Descriptive Geometry | 3 |
| C. E. 288: Surveying | 2 |
| Engl. 117: Narration and Description | 3 |
| Math. 42a: Plane Trig. | 1 |
| Math. 43: Plane Analytic Geometry | 4 |
| Mil. Sci. 2: Military Art | 1 |
| Phys. Tr. 2 | R |
| | 18 |

SOPHOMORE YEAR

| Third Semester | Credits |
|---|---|
| Arch. E. 304: Elements of Arch. | 3 |
| Arch. E 314: Freehand Drawing | 2 |
| C. E. 391: Field Work | 1 |
| Engl. 412: Argumentation | 2 |
| Math. 44: Calculus | 5 |
| Mil. Sci. 3: Military Art | 1 |
| Phys. Tr. 3 | R |
| Physics 303· Mechanics and Heat | 5 |
| | 19 |

| Fourth Semester | Credits |
|---|---|
| Arch. E. 416: Freehand Drawing | 2 |
| Arch. E 436: Design and Theory of Arch | 3 |
| Math 45: Calculus | 5 |
| M. E. 401: Mechanics of Engineering | 3 |
| Phys. Tr 4 | R |
| Mil. Sci. 4· Military Art | 1 |
| Physics 404. Electricity and Magnetism, Light and Sound | 5 |
| | 19 |

JUNIOR YEAR

| Fifth Semester | Credit |
|---|---|
| Arch. E. 503· Hist. of Arch | 2 |
| Arch. E. 505: Seminar | R |
| Arch. E. 537: Freehand Drawing | 1 |
| C E. 515: Str. Lab. | 1 |
| C. E. 553: Materials of Construction | 2 |
| E. E. 567: Small Electric Plants | 2 |
| M. E. 588: Mechanics of Engr. | 5 |
| †Ec. Sci. 214: Engineering Economics | 2 |

| Sixth Semester | Credit |
|---|---|
| Arch E 607: Seminar | R |
| Arch. E. 625: Hist. of Arch | 2 |
| C E 614: Cement and Masonry Lab | 1 |
| C E. 623· Masonry Const. and Foundation | 2 |
| C. E. 626: Str. Engr. | 5 |
| Engl. 115: Engr. Engl. | 2 |
| Engr. 603: Conservation of Natural Resources | 1 |
| †M E. 660: Hydraulics | 3 |

[1] The number refers to the description of the study
[2] For definition of a credit see page 81
[3] R indicates that the study is required, without credit, for graduation.
† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | |
|---|---|---|---|
| †Geol. 3: Engineering Geology | 3 | †A. E. 38: Farm Structures | 2 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| | 19[5] | | 19[5] |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credit |
|---|---|---|---|
| Arch. E. 709: Seminar | R | Arch. E. 811: Seminar | R |
| Arch. E. 728: Fireproof Const. | 2 | Arch. E. 819: Industrial Strs. | 2 |
| C. E. 738: Reinforced Concrete Strs. | 3 | Arch. E. 824: Elements of Contracting | 3 |
| C E. 747: Structural Engr. | 5 | Arch. E. 834: Thesis | 3 |
| Engr. 702: Specifications and Contracts | 1 | C. E. 848: Str. Engr. | 5 |
| M. E. 707: Heating and Ventilating | 2 | C. E. 849: Advanced Reinforced Concrete | 2 |
| M. E. 726: Heating Design | 2 | Engr. 801: Hist. of Engr. | 1 |
| †Mil. Sci. 11: Military Art | 1 | †C. E. 840: Building Sanitation | 2 |
| †Phys. 708: Illumination | 3. | †Mil. Sci. 12: Military Art | 1 |
| | 19 | | 19 |

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Technical Subjects | 101, 202 | 727, 728, 735, 819, 824, 834 | |
| Construction | 113, 215 | | |
| Drawing and Design | 304, 436, 212, 314, 416, 429 | 417, 518, 537, 622 | 1038 |
| Seminars | | 505, 607, 709, 811 | |
| Hist. of Arch. | 503 | 625, 726 | |

101. **Technical Lecture.** Definitions and general discussion of Architectural Engineering; the ideals of the profession; the reading of current literature; brief resumé of great achievements in the past and topics of interest to young men entering the profession.

1st Sem. Lecture 1; required.

113. **Working Drawings.** Study of a frame house of moderate cost. Sketch plans at small scale are assigned and the students work out the necessary construction drawings. Structural and decorative properties of materials; detailing at large scale of various parts—floors, walls, roofs,

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Engineering. See Business Engineering, page 131.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

doors, windows, cornices, stairs, wainscoting, cabinet work, interior finish, etc., and the preparation of working drawings.

1st or 2nd Sem. Labs. 2, 3 hr.; credit 2; fee $1.50.

202. **Technical Lecture.** Continuation of 101. Discussion of various problems of the designer. Introduction to the elements of design. Three lectures of this study are given by College librarians in explanation of card catalogue systems and the use of reference books.

2nd Sem. Lecture 1; required.

212. **Freehand Drawing.** Outline representations of simple objects, in groups, as exercises in developing the powers of observation and in the training of the hand.

1st or 2nd Sem. Labs. 2, 3 hr.; credit 2.

215. **Working Drawings.** Study of a building of fire-resisting construction. Preparation of the necessary working drawings for the structure. Methods of detailing. Use of stone, brick, tile, terra cotta, and concrete in permanent structures. Discussions and exercises in the class room. Writing of specifications of the best practice in construction.

2nd Sem. Prerequisite 118; recitation 1; labs. 2, 3 hr.; credit 2; fee $1.50.

304. **Elements of Architecture.** Perspective, shades and shadows; relations of plans, elevations, and sections to each other.

3rd Sem. Labs. 3, 3 hr.; credit 3; fee $1.00.

314. **Freehand Drawing.** Continuation of 112. Elementary drawing in charcoal from grouped objects and from casts, etc., as exercises in representations of the third dimension.

2nd or 3rd Sem. Labs. 2, 3 hr.; credit 2.

416. **Freehand Drawing.** Drawing in charcoal from casts of architectural ornament, architectural fragments, and parts of the figure.

3rd or 4th Sem. Labs. 2, 3 hr.; credit 2.

417. **Freehand Drawing.** Continuation of 416.

4th or 5th Sem. Lab. 2, 3 hr.; credit 2.

429. **Freehand Drawing.** Practice in pen, pencil, and charcoal; studies in wash, rendering and watercolors. For Landscape Gardening students.

4th Sem. Lab. 1, 2 hr.; credit ⅔.

436. **Design and Theory of Architecture.** Continuation of 304. Perspective, conventional rendering, relations of plans, sections, and elevations to each other.

4th Sem. Prerequisite 304; labs. 3, 3 hr.; credit 3.

503. **History of Architecture.** Influence of past styles upon modern buildings. The various styles—Egyptian, Assyrian, Persian, Babylonian, Greek, Roman, Byzantine, and Early Christian. Each style analyzed and its chief characteristics studied with particular reference to what it has contributed to modern civilization. Lectures illustrated by lantern slides. Assigned readings, sketches, and reports.

5th Sem. Lectures 2; credit 2; fee $1.00.

505. **Seminar.** One hour a week devoted to discussions and reports

on interesting building problems. Analysis of modern practice; points a building superintendent should know about methods of laying brick, cement work, plumbing, wiring, etc. Fireproofing and fire prevention appliances.
5th Sem. Required.

518. **Freehand Drawing.** Exercises in the handling of water color and in translation of color.
5th Sem. Prerequisites 417, 416, 214, 212; lab. 2, 3 hr.; credit 2.

537. **Freehand Drawing.** Continuation of 316 for Architectural Engineering students.
5th Sem. Lab. 1, 3 hr.; credit 1.

607. **Seminar.** See 505 for description of work.
6th Sem. Required.

622. **Freehand Drawing.** Practice in sketching; pencil rendering of architectural objects and photographic subjects.
6th Sem. Lab. 2, 3 hr.; credit 2.

625. **History of Architecture.** A continuation of 503. Commences with Romanesque and continues through the Modern Style.
6th Sem. Lectures 2; credit 2; fee $1.00.

709. **Seminar.** See 505 for description of work.
7th Sem. Required.

726. **History of Architecture.** General survey of the history of various styles of architecture including Egyptian, Assyrian, Persian, Babylonian, Greek, Byzantine, Early Christian, Romanesque, Gothic, Renaissance, Modern, Indian, Chinese, and Japanese. Each style analyzed and the chief characteristics studied with particular reference to what it has contributed to modern civilization. Lectures illustrated by lantern slides and supplemented by assigned readings and sketches.
7th Sem. Lecture 1; credit 1; fee $1.00.

727. **Design and Theory of Architecture.** Continuation of 436. Problems in planning. For students who wish to specialize on design.
7th Sem. Prerequisite 436; labs. 3, 3 hrs.; credit 3.

728. **Elements of Fireproof Building Construction.** Analysis of various types of fireproofing structural members, columns, beams, and girders. Requirements of the National Board of Fire Underwriters. Fire protection apparatus, sprinkler systems, automatic alarms, doors, pneumatic water systems, etc. Economics of fire protection.
7th Sem. Lectures 2; credit 2; fee $1.00.

735. **General Course for Senior Engineering Students.** A brief analysis of the architectural styles and their application to modern building construction. The uses of the various materials, their limitations, etc. Ways and means of getting pleasing lines in buildings of concrete construction. A general analysis of methods employed by building superintendents. What should be known about the different trades. Points coming up in everyday practice.
7th Sem. Lectures 2; credit 2; fee $1.00.

811. **Seminar.** See 505 for description of work.
8th Sem. Required.

819. **Industrial Structures.** The different kinds of industrial structures; their requirements and ways of improving their appearance. Recreation buildings and homes for employees. Methods of sanitation, heating and ventilation, and safety devices employed in modern industrial plants. Problems in planning a factory group, etc. Study of best materials and their limitations. Necessity for an architectural treatment of the exterior of such structures.
8th Sem. Prerequisite, Senior standing; labs. 2, 3 hr.; credit 2; fee $1.00.

824. **Elements of Contracting.** Discussion and writing of specifications. Ordinary methods of estimating employed by building contractors; approximate and exact methods.
8th Sem. Lectures 2; lab. 1, 3 hr.; credit 3.

834. **Thesis.** The working out of an extended original problem in design, to be accompanied by a carefully prepared report on the solution of the scheme.
8th Sem. Lab. 3, 3 hr.; credit 3

1038. **Advanced Design.** Advanced work in industrial and rural building practice; special advanced work in steel, masonry, and frame building construction. PROFESSOR KIMBALL.
Open for major or minor subjects. Details of classification specially arranged.

## Course in Rural Structure Design

Leading to a Two-year Collegiate Certificate in Rural Structure Design.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| R. S. D. 100[1]: Tech. Lecture | R[3] | R. S. D. 200: Tech. Lecture | R |
| Arch. E. 212: Freehand Drawing | 2 | Arch. E. 113: Working Drawing | 2 |
| Chem. 111: General Chem. | 5 | Arch. E. 314: Freehand Drawing | 2 |
| C. E. 101: Freehand Lettering | 1 | C. E. 264: Descriptive Geom. | 3 |
| Engl. 116: Exposition | 4 | C. E. 288: Surveying | 2 |
| Math. 40: College Algebra | 3 | Engl. 117: Narration and Description | 3 |
| Math. 41: Plane Trig. | 2 | Math. 42a: Plane Trig. | 1 |
| Mil. Sci. 1: Military Art | 1 | Math. 43: Plane Analytic Geometry | 4 |
| Phys. Tr. 1: Gymnasium | R | Mil. Sci. 2: Military Art | 1 |
| | | Phys. Tr. 2: Gymnasium | R |
| | 18 | | 18 |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| R. S. D. 301: Rural Design | 3 | R. S. D. 402: Rural Design | 3 |
| R. S. D. 321: Specifications and Estimating | 1 | R. S. D. 420: Sanitation of Buildings | 1 |
| Arch. E. 416: Freehand Drawing | 2 | Arch. E. 417: Freehand Drawing | 2 |
| Engl. 412: Argumentation | 2 | Agr'l Engr. 38: Farm Structures | 2 |
| Math. 44: Calculus | 5 | L. A. 41: Rural Improvement | 2 |
| Mil. Sci 3: Military Art | 1 | Math. 45: Calculus | 5 |
| Phys. 303: Mechanics and Heat | 5 | M. E. 401: Mechanics of Engineering | 3 |
| Phys. Tr 3: Gym | R | Mil. Sci. 4: Military Art | 1 |
| | | Phys. Tr. 4: Gym. | R |
| | 19 | | 19 |

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Technical Subjects | 100, 200, 321, 420 | | |
| Drawing and Design | 301 | 402 | |

100. **Technical Lecture.** Definitions and general discussion of Rural Structures; the ideals of the profession; the reading of current literature; brief resumé of great achievements in the past and topics of interest to young men entering the profession.

1st Sem Lecture 1; required.

200. **Technical Lecture.** Continuation of 100. Discussion of various problems of the designer. Introduction to the elements of design. Three lectures of this study are given by College librarians in explanation of card catalogue systems and the use of reference books.

2nd Sem. Lecture 1; required

301. **Elementary Rural Design.** Architectural elements such as walls, doors, windows, the orders, etc.; shades and shadows.

3rd Sem. Labs. 3, 3 hr.; credit 3.

321. **Specifications and Estimating.** General methods employed in writing specifications. Exact and approximate methods of estimating.

3rd Sem. Lecture 1; required.

402. **Elementary Rural Design.** Continuation of 301. Perspectives, conventional rendering; relation of plans, sections, and elevations to each other.

4th Sem. Prerequisite 301; lecture 1; labs. 2, 3 hr.; credit 3.

420. **Sanitation of Buildings.** Plumbing, trap ventilation, removal of wastes; construction of water closets, drains, and systems of water supply; sewage disposal and fixtures.

4th Sem. Lecture 1; credit 1.

## BACTERIOLOGY AND HYGIENE

PROFESSOR BUCHANAN, Room 1, Science Building

Professors Brown, Hammer; Associate Professor Rice; Assistant Professor Levine; Instructor Clark; Teaching Fellow Bruett; Research Fellow Orr

*For information concerning the Division of Industrial Science see page 76.*

The department is housed on the first and second floors of the new science hall. This building was planned to furnish the best possible accommodations to bacteriological laboratories. The large general student laboratories, accommodating forty and thirty students respectively at one time, are well equipped with standard laboratory tables, lockers, sterilizers, autoclaves, thermostats, and microscopes. The general laboratory on the first floor is intended for those students, both elementary and advanced, who should secure special instruction in the pathogenic bacteria of importance in the live stock industry. A room for small animals, a small autopsy room, and a room designed primarily for work in immunity and serum therapy are provided, together with dispensing room, offices, research, and class rooms. On the second floor the general laboratory is designed for the needs of students in general bacteriology in such courses as Agronomy, Dairying, Forestry, Horticulture, Home Economics, and Sanitary Engineering. Rooms are also planned for diagnostic work, for research work, and for investigations in both engineering and agricultural experiment stations.

The laboratories in soil bacteriology are housed with the Department of Soils on the first floor of Agricultural Hall. Student laboratories, accommodating thirty-six students, with laboratory furniture and apparatus, a dispensing room, and a room for thermostats and for storage purposes are provided. The research laboratory is well fitted for graduate work. The greenhouses of the Department of Agronomy, the experimental plats of the Experiment Station, and the soil research and analytic laboratories are all available for the advanced student.

The laboratories in dairy bacteriology are situated on the third floor of the Dairy Building. They consist of a student laboratory accommodating thirty-two students, a preparation room, store room, and large research or station room. Each of the laboratories has four constant temperature rooms connected with a refrigeration plant and supplied with gas. The laboratory furniture and equipment is quite complete.

The laboratories in veterinary bacteriology are well equipped for both undergraduate and graduate courses in bacteriology in its relationships to the diseases of animals.

### Course in Industrial Science — Major Bacteriology

This course is designed to give fundamental training in general and technical bacteriology such as will fit men as agricultural bacteriologists,

soil bacteriologists, dairy bacteriologists, veterinary bacteriologists, sanitary experts, and sanitary bacteriologists, and experts in bacteriology as related to the home. Positions in bacteriology in the various bureaus of the United States Department of Agriculture, the various agricultural experiment stations, engineering experiment stations, colleges in which sanitary engineering, agriculture, and home economics are taught, sanitary laboratories of cities and boards of health, are increasing rapidly in number.

For Freshman and Sophomore years, see page 246.

For general instructions as to senior college work, see page 247.

Students intending to major in Bacteriology should take Chemistry (through organic) during the freshman and sophomore years. Physics should be taken through the sophomore year. The bacteriology should begin either in the second semester of the sophomore year or in the first semester of the junior year. Students should use care in outlining the work of the sophomore year to see that the proper sequence is started which will give all the prerequisites for the technical field in which specialization is desired.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| General Bacteriology | 2[1], 15, 19, 26, 28 | 1, 5, 6, 35 | 30 |
| Veterinary and Pathogenic Bacteriology | 63 | 50, 55, 60, 61, 62 | 70, 71, 72 |
| Dairy Bacteriology | 140 | 101, 111, 112, 118 | 141 |
| Sanitary Bacteriology and Hygiene | 150, 170 | 155, 160 | 171 |
| Soil Bacteriology | | 201, 202, 210, 221, 222 | 231, 232 |
| Home Economics Bacteriology | 18, 259 | | 260 |

### GENERAL BACTERIOLOGY

1. **General Bacteriology.** Morphology, classification, physiology, and cultivation of bacteria; relation of bacteria to health of man and animals, to infection, contagion, immunity, and to other scientific and agricultural problems. Laboratory work on methods of cultivating bacteria and the study of bacterial functions and activities, bacterial content of water and food, with interpretation of results reached.

**5th or 6th Sem. Prerequisite, Organic Chemistry; recitations 2; labs. 3, 2 hr.; credit 4; fee $5.00.**

2. **General Bacteriology, Horticulture.** Similar to 1, but with particular reference to needs of students in Horticulture.

**4th Sem. Prerequisite, Organic Chemistry; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5.00.**

5. **Systematic Bacteriology.** Advanced study in the classification

[1] The number refers to the description of the study.

and relationships of bacteria, intended for students who expect to do original or advanced work in any field of bacteriology or plant pathology.

Fall Sem. Prerequisite, General Bacteriology; lectures, assigned readings, conferences, and laboratories; credit 2-4; fee $5.00.

6. **Physiology of Bacteria.** Advanced study on effect of environment upon the physiological activities of micro-organisms. Laws of physical chemistry in their relationships to bacteriological problems. Practical application of theory to the preparation of media, standardization of disinfectants, food preservation, soil fertility, enzyme action and fermentative products of commercial importance.

Spring Sem. Prerequisite, General Bacteriology; lectures 2; lab. 0-6 hrs.; credit 2-4; fee $5.00.

15. **General Bacteriology, Animal Husbandry.** A discussion of general bacteriology, followed by study of the relationship of bacteria to agriculture with particular reference to the live stock industry.

5th or 6th Sem. Prerequisite, Organic Chemistry; recitations 2; lab. 2, 2 hr.; credit 3⅓, fee $5.00.

18. **Bacteriology and Fermentations.** Bacteria in their relation to the home, including a brief consideration of the pathogenic forms and the bacteria, yeasts, and molds in their zymotic activities.

6th Sem. Prerequisite, Organic Chemistry; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5 00.

19. **General Bacteriology for Foresters.** Morphology, classification, physiology, and cultivation of bacteria; bacteria as causes of disease; transmission and prevention of disease; camp sanitation, stream pollution; bacteria in relation to decay.

8th Sem. Prerequisite, Organic Chemistry; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $4.00.

26. **General Bacteriology, Sanitary Engineers.** Similar to Bact. 1, but subject material chosen of particular value to students in sanitary engineering.

7th or 8th Sem Recitations 2; lab. 1, 3 hr ; credit 3; fee $4 00.

28. **Research in General or Systematic Bacteriology.** For undergraduate students.

Either Sem. Prerequisite 1, 5, or equivalent; credit 2 to 5; fee $5.00

30. **Research in General or Systematic Bacteriology.** For graduate students. PROFESSOR BUCHANAN

Either Sem. Prerequisites 1 and 5 or equivalent; fee $5.00.

35. **Seminar.** Required of all students who take major work in Bacteriology.

Each Sem. Credit 1, for each semester taken.

VETERINARY AND PATHOGENIC BACTERIOLOGY

50. **General and Pathogenic Bacteriology.** Same as Vet. Path. 350. Morphology, classification, cultivation, and physiological characters of bacteria; the preparation of plain and special media; the principles of infection and contagion; discussion of the various theories of immunity as related to bacterial infection; methods of producing immunity; the bacteria producing diseases of animals.

3rd Sem. Recitations 4; labs. 2, 3 hr.; credit 6; fee $5 00.

55. **Special Poultry Bacteriology.** The bacteria that produce diseases in poultry, and the relationships of bacteria to storage of poultry and poultry products, the decomposition of eggs, and related problems.

6th Sem. Prerequisite General Bacteriology; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $4.00.

60. **Immunity and Serum Therapy.** Same as Vet. Path. 860. Theories of immunity and immunization; preparation of bacterins, vaccines, and antisera; serum tests in the diagnosis of disease.

8th Sem. Prerequisite 50; recitation 2; credit 2.

61. **Immunity and Serum Therapy for Advanced Students.** Theories of immunity and immunization; preparation of vaccines and antisera. Primarily intended for students in technical bacteriology looking forward to research work.

8th Sem. Prerequisite 60; lectures 2; lab. 1, 3 hr.; credit 3; fee $3.00.

62. **Laboratory in Immunity and Serum Therapy.** Same as Vet. Path. 862. Supplementary to 60.

8th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

63. **Research in Pathogenic Bacteriology.** For undergraduate students.

Either Sem. Prerequisites 1 and 60 or equivalent; credit 2 to 5 hrs.; fee $5.00.

70. **Immunity and Serum Therapy.** Continuation of 61 for graduate students. ASSOCIATE PROFESSOR MURRAY

Recitations, assigned readings, conferences, and laboratories as arranged; credit 3; fee $5.00.

71. **Pathogenic Bacteriology.** Continuation of 50 for graduate students. ASSOCIATE PROFESSOR MURRAY

Recitations, assigned readings, conferences, and laboratories as arranged; credit 3; fee $5.00.

72. **Research in Pathogenic Bacteriology.** For graduate students. PROFESSOR BUCHANAN OR ASSOCIATE PROFESSOR MURRAY.

Either Sem. Prerequisites 1 and 60 or equivalent; fee $5.00.

### DAIRY BACTERIOLOGY

101. **Dairy Bacteriology.** Same as Dairy 101. Bacteria in milk and its derivatives; the sources, modes of entry, and the subsequent changes produced; the production and handling of dairy products from a hygienic viewpoint, and their relations to the spread of disease.

6th or 8th Sem. Prerequisite 1; recitations 2; lab. 3, 2 hr.; credit 2 to 4; fee $5.00.

111. **Advanced Dairy Bacteriology.** Same as Dairy 111. Advanced work in the relation of bacteria to dairying, with particular reference to the importance of bacteria in milk and cheese.

7th Sem. Prerequisite, 101; lecture 2; credit 2.

112. **Advanced Dairy Bacteriology Laboratory.** Same as Dairy 112. Laboratory work outlined to accompany Bact. 111. Special attention is given to the isolation and identification of organisms important in dairying.

7th Sem. Prerequisite, 101; labs. 3, 2 hr.; credit 2; fee $5.00.

and relationships of bacteria, intended for students who expect to do original or advanced work in any field of bacteriology or plant pathology.

Fall Sem. Prerequisite, General Bacteriology; lectures, assigned readings, conferences, and laboratories; credit 2-4; fee $5.00.

6. **Physiology of Bacteria.** Advanced study on effect of environment upon the physiological activities of micro-organisms. Laws of physical chemistry in their relationships to bacteriological problems. Practical application of theory to the preparation of media, standardization of disinfectants, food preservation, soil fertility, enzyme action and fermentative products of commercial importance.

Spring Sem. Prerequisite, General Bacteriology; lectures 2; lab. 0-6 hrs.; credit 2-4; fee $5.00.

15. **General Bacteriology, Animal Husbandry.** A discussion of general bacteriology, followed by study of the relationship of bacteria to agriculture with particular reference to the live stock industry.

5th or 6th Sem. Prerequisite, Organic Chemistry; recitations 2; lab. 2, 2 hr.; credit 3⅓, fee $5.00.

18. **Bacteriology and Fermentations.** Bacteria in their relation to the home, including a brief consideration of the pathogenic forms and the bacteria, yeasts, and molds in their zymotic activities.

6th Sem. Prerequisite, Organic Chemistry; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5 00.

19. **General Bacteriology for Foresters.** Morphology, classification, physiology, and cultivation of bacteria; bacteria as causes of disease; transmission and prevention of disease; camp sanitation, stream pollution; bacteria in relation to decay.

8th Sem. Prerequisite, Organic Chemistry; recitations 2, lab. 1, 2 hr.; credit 2⅔; fee $4.00.

26. **General Bacteriology, Sanitary Engineers.** Similar to Bact. 1, but subject material chosen of particular value to students in sanitary engineering.

7th or 8th Sem. Recitations 2; lab. 1, 3 hr; credit 3; fee $4 00

28. **Research in General or Systematic Bacteriology.** For undergraduate students.

Either Sem. Prerequisite 1, 5, or equivalent; credit 2 to 5; fee $5.00.

30. **Research in General or Systematic Bacteriology.** For graduate students. PROFESSOR BUCHANAN

Either Sem. Prerequisites 1 and 5 or equivalent; fee $5.00.

35. **Seminar.** Required of all students who take major work in Bacteriology.

Each Sem. Credit 1, for each semester taken.

### VETERINARY AND PATHOGENIC BACTERIOLOGY

50. **General and Pathogenic Bacteriology.** Same as Vet. Path. 350. Morphology, classification, cultivation, and physiological characters of bacteria; the preparation of plain and special media; the principles of infection and contagion; discussion of the various theories of immunity as related to bacterial infection; methods of producing immunity; the bacteria producing diseases of animals.

3rd Sem. Recitations 4; labs. 2, 3 hr.; credit 6; fee $5 00.

55. **Special Poultry Bacteriology.** The bacteria that produce diseases in poultry, and the relationships of bacteria to storage of poultry and poultry products, the decomposition of eggs, and related problems.

6th Sem. Prerequisite General Bacteriology; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $4.00.

60. **Immunity and Serum Therapy.** Same as Vet. Path. 860. Theories of immunity and immunization; preparation of bacterins, vaccines, and antisera; serum tests in the diagnosis of disease.

8th Sem. Prerequisite 50; recitation 2; credit 2.

61. **Immunity and Serum Therapy for Advanced Students.** Theories of immunity and immunization; preparation of vaccines and antisera. Primarily intended for students in technical bacteriology looking forward to research work.

8th Sem. Prerequisite 60; lectures 2; lab. 1, 3 hr; credit 3; fee $8.00.

62. **Laboratory in Immunity and Serum Therapy.** Same as Vet. Path. 862. Supplementary to 60.

8th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

63. **Research in Pathogenic Bacteriology.** For undergraduate students.

Either Sem. Prerequisites 1 and 60 or equivalent; credit 2 to 5 hrs.; fee $5.00.

70. **Immunity and Serum Therapy.** Continuation of 61 for graduate students. ASSOCIATE PROFESSOR MURRAY

Recitations, assigned readings, conferences, and laboratories as arranged; credit 3; fee $5.00.

71. **Pathogenic Bacteriology.** Continuation of 50 for graduate students. ASSOCIATE PROFESSOR MURRAY

Recitations, assigned readings, conferences, and laboratories as arranged; credit 3; fee $5.00.

72. **Research in Pathogenic Bacteriology.** For graduate students. PROFESSOR BUCHANAN OR ASSOCIATE PROFESSOR MURRAY.

Either Sem. Prerequisites 1 and 60 or equivalent; fee $5.00.

### DAIRY BACTERIOLOGY

101. **Dairy Bacteriology.** Same as Dairy 101. Bacteria in milk and its derivatives; the sources, modes of entry, and the subsequent changes produced; the production and handling of dairy products from a hygienic viewpoint, and their relations to the spread of disease.

6th or 8th Sem. Prerequisite 1; recitations 2; lab. 3, 2 hr; credit 2 to 4; fee $5.00.

111. **Advanced Dairy Bacteriology.** Same as Dairy 111. Advanced work in the relation of bacteria to dairying, with particular reference to the importance of bacteria in milk and cheese.

7th Sem. Prerequisite, 101; lecture 2; credit 2.

112. **Advanced Dairy Bacteriology Laboratory.** Same as Dairy 112. Laboratory work outlined to accompany Bact. 111. Special attention is given to the isolation and identification of organisms important in dairying.

7th Sem. Prerequisite, 101; labs. 3, 2 hr.; credit 2; fee $5.00.

118. **Special Dairy Bacteriology.** Same as Dairy 118. Laboratory investigations, assigned readings, and reports on bacteriological problems relating to dairying; the nature of the work being largely adapted to the individual student.

8th Sem. Prerequisite 101; credit 2 to 6; fee $5.00.

140. **Research in Dairy Bacteriology.** Same as Dairy 140. For undergraduate students.

Either Sem. Prerequisite 112.

141. **Research in Dairy Bacteriology.** For graduate students.

Either Sem. Prerequisite 101. PROFESSOR HAMMER

SANITARY BACTERIOLOGY AND HYGIENE

150. **Sanitary Science and Hygiene.** Immunity, vaccination, epidemiology, etc. Designed especially for engineers and other students with little or no preparation in the biological sciences. Primary object, to teach how to avoid preventable diseases, such as malaria, typhoid, smallpox, etc.

6th or 8th Sem. Lecture 1; credit 1.

155. **Sanitary Bacteriology and Microscopy.** Microörganisms found in water supplies. Numerous samples of water analyzed to render the student proficient in laboratory technique. Emphasis laid upon the algae responsible for disagreeable tastes and odors, and upon interpretation of bacteriological analyses.

5th or 7th Sem. Prerequisite 26 or equivalent; lecture 1; lab. 1, 3 hr.; credit 2; fee $4.00.

160. **Municipal Sanitation and Hygiene.** Principles of water supply, sewage and garbage disposal, disinfection, air conditions, control of contagious disease, and other problems related to the sanitation of cities and towns.

6th or 8th Sem. Prerequisite 26 or equivalent; lectures 2; credit 2.

170. **Research in Sanitary Bacteriology or Hygiene.** For undergraduate students.

Either Sem. Prerequisites 1 and 155 or equivalent; credit 2 to 5 hrs.; fee $5.00.

171. **Research in Sanitary Bacteriology or Hygiene.** For graduate students. ASSISTANT PROFESSOR LEVINE

Either Sem. Prerequisites 1 and 155 or equivalent; fee $5.00.

SOIL BACTERIOLOGY

201. **Soil Bacteriology.** Same as Soils 201. Soil bacteria and their activities in their natural habitat, and a preliminary consideration of the influence which they exert on soil fertility. Involves purely quantitative bacteriological examinations of soils, followed by quantitative and qualitative studies of all the important bacterial processes occurring in the soil.

6th Sem. Prerequisites. Soils 322 or 342 and Bact. 1; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5.00.

202. **Soil Bacteriology.** Same as Soils 202. A lecture subject identical with 201, except that no laboratory work is required. A required

study for students in Farm Management. Elective for all other agricultural students except those in Farm Crops and Soils.

6th or 8th Sem. Prerequisites Soils 322 or 342 and Bact. 1 or 15; recitations 2; credit 2.

210. **Soil Mycology and Protozoology.** Classification, methods of isolation, and activities of fungi (exclusive of the bacteria), algae, and the protozoa in soils.

5th or 7th Sem. Prerequisite Bact. 201; lectures and readings 2 hrs.; lab. 1 to 3, 2 hr.; credit 2⅔ to 4; fee $3.00.

221. **Special Problems in Soil Bacteriology.** Same as Soils 221. The influence of bacterial activities on soil fertility. Special problems dealing with the fixation of atmospheric nitrogen, the transformation of nitrogenous, carbonaceous, and mineral compounds of the soil; the effect of manurial and fertilizer treatment on various activities; the adequacy of present bacteriological methods.

7th or 8th Sem. Prerequisite 201; investigations 6 hrs. per week; credit 2; fee $5.00.

222. **Advanced Special Problems in Soil Bacteriology.** Same as Soils 222. A continuation of 221.

8th Sem. Prerequisite 221; investigations 6 hrs. per week; credit 2; fee $5.00.

231. **Research in Soil Bacteriology.** Same as Soils 231. Bacterial activities in the soil. Field, greenhouse, or laboratory experiments. The classification of soil bacteria. Molds, protozoa, and higher bacteria; occurrence and action in soils. General study of the relation of soil organisms to fertility. PROFESSOR BROWN

Either Semester. Prerequisite 201; credit 5 or 10; fee $5.00.

232. **Conference in Soil Bacteriology.** Same as Soils 232. Reports and discussion on current investigations. PROFESSOR BROWN

Either semester.

HOUSEHOLD BACTERIOLOGY

259. **Research in Household Bacteriology.** For undergraduate students. PROFESSOR BUCHANAN

Either Sem. Prerequisite 18 or equivalent; credit 2 to 5; fee $5.00.

260. **Research in Household Bacteriology.** For graduate students. PROFESSOR BUCHANAN

## BOTANY

PROFESSOR PAMMEL, Central Building, Room 314

Professors Martin, Melhus; Associate Professor Bakke; Instructors Hayden, Yocum, Durrell; Fellows Kirby, Willey; Assistant Smyth; Librarian Rees

*For information concerning the Division of Industrial Science see page 76.*

It is the purpose of the Department of Botany to give a good foundation for the technical work in Horticulture, Farm Crops and Soils,

Forestry, Animal Husbandry, Dairying, and Home Economics, besides fitting men and women for special lines of technical work as teachers and investigators in High Schools, Colleges, and Experiment Stations.

The department occupies the major portion of the third floor of the Central Building and several rooms on the fourth floor and in Morrill Hall. The several laboratories in plant pathology, morphology, physiology and economic botany are all well supplied with apparatus of the most approved modern manufacture and with an abundance of working material. The lecture room is equipped with a complete outfit for lantern demonstrations. The department has a splendid herbarium comprising the Parry collection of 25,000 specimens and the general herbarium of 60,000 specimens, besides a splendid collection of grasses presented to the college by Professor A. S. Hitchcock. There are also special collections of fungi, including the more important exsiccati, as well as the beginning of an economic museum. A greenhouse is connected with the botanical department.

The several divisions of the department are well equipped for doing advanced research work in Morphology, Plant Pathology, Plant Physiology, Economic and Taxonomic Botany.

### Course in Industrial Science—Major Botany

For outline of Freshman and Sophomore years, see page 246.

During the Junior and Senior year the student may major in any one of the following divisions of botany: economic botany, plant physiology, plant morphology, or plant pathology.

The student who expects to pursue work in any division of botany should take at least ten hours of botany during the Freshman and Sophomore year. During the first two years the students are advised to elect work in the other fundamental sciences as Mathematics, Physics, Zoology and Chemistry. As far as practicable the student should endeavor to secure a reading knowledge of French and German.

### Course in Industrial Science—Major Plant Pathology

For the Freshman and Sophomore years, see pages 246 and 247. During the Junior year students are required to take General Plant Pathology of Agronomic Plants 366, General Bacteriology 1, Organic Chemistry 251, General Entomology 304, Diseases of Special Crops (Advanced) 367, Plant Physiology 268, Organic Chemistry 252 and General Horticulture 3. In the Senior year the following subjects are required: Seminar in Plant Pathology 682a, General Mycology 497, Plant Embryogeny 124, Soil Fertility 342, Advanced General Bacteriology 5, Diseases of Special Crops (Advanced) 367, Soil Bacteriology 201, Systematic Spermatophytes 470 and Economic Entomology 317.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Ecology | 26[1] | 18, 91 | |
| Morphology | 109, 127, 128, 161a, 161b | 164, 165, 119, 192, 189, 190 | 103, 180, 196 |
| Physiology | 268, 269, 287 | 290 | 291, 292 |
| Pathology | | 308, 365, 366, 367 | 304, 309, 310, 311, 312 |
| Taxonomy | | 407, 413, 470, 497 | 496, 498 |
| Economic | 514, 516, 572, 588 | 560, 564 | 500, 501, 597, 599 |
| History, Seminar, Theses and Themes | 623 | 681, 682, 688 | 602 |

The following studies in this department have been omitted from the catalogue for the period of the war: 105, 185, 406, 417, 567.

### ECOLOGY

18. **Flower Ecology.** Pollination of flowers, nectar secretion, and their relation to agriculture.

3rd or 5th Sem. Prerequisite 161 or 127; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.00.

26. **Ecology.** Relation of plants to their environment, under the factors of water, heat, light, air, soil, and animals; considering the anatomical structures of plants, especially with reference to environment. The pollination of some economic plants like maize, wheat, clover, rosaceous and leguminous plants; the dissemination of plants; symbiosis; myrmecophytes.

3rd or 5th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00.

36. **Field Ecology.** Field work in ecology for forestry students given during the summer. Summer camp work.

Prerequisites Bot. 26, 127; credit 1; fee $1.00.

91. **Advanced Ecology.** Distribution of plants with reference to soil, moisture, and relation to other floras. PROFESSOR PAMMEL

Either Sem. Prerequisites 161 or 127 or 128, 268, 470, Bact. 1, Geol. 1, Soils 121, C. E. 102; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 5 or 10; fee $3.00 or $5.00.

### MORPHOLOGY

103. **Cytology.** How to kill, imbed, section, and stain material; a knowledge of the various stages in the development of the pistils and stamens of flowers; the investigation of some problems which will give skill in the use of the above processes.

ASSOCIATE PROFESSOR MARTIN

Either Sem. Prerequisites 161, 127, 268; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 5 or 10; fee $3.00 to $5.00.

[1] The number refers to the description of the study.

109. **Structural Botany.** Designed for veterinary students, since the well equipped veterinarian must have a knowledge of the terms used in morphological botany, and of the microscopic structure of plants.

1st Sem. Recitations 2; lab. 1, 3 hr.; credit 3; fee $3.00.

119. **Morphology of Farm Crops.** The root, stem, leaf, seed and floral structures of corn, wheat, oats, clover, alfalfa, etc., as related to the cultivation, breeding and germination of the seeds of these plants.

PROFESSOR MARTIN

7th Sem. Prerequisites 161, or 127 and 128; recitation 1; labs. 2, 2 hrs.; credit 2⅓; fee $3.00.

124. **Plant Embryogeny.** The four large divisions of the plant kingdom, with emphasis upon those phases relating to plant breeding, such as origin of sex cells, results of fertilization, origin and elaboration of the sporophyte and evolution of the seed and fruit, and such features of the sporophyte as Mendelian inheritance, variation, mutations, modifications, correlations, acquired characters and chimeras.

5th or 7th Sem. Prerequisite 127 or 161; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00.

127. **General Botany.** General Morphology of the flowering plants and a study of the cell structure, tissues, tissue systems, and contents.

1st Sem. Recitations 4; lab. 1, 3 hr.; credit 5; fee $3.00.

128. **General Botany.** Special Morphology of lower classes of plants and their systematic position in the vegetable kingdom; followed by a study of mosses, ferns, and flowering plants, with a brief study of plants and their relation to their environment.

2nd Sem. Prerequisite 127; recitations 4; lab. 1, 3 hr.; credit 5; fee $3.00.

161. **Plant Morphology.** First Part: structures of the higher plants; purpose, to support the work in home economics and agriculture. Second part: different plant groups; purpose, to make clear plant evolution, and to lay a basis for the study of bacteriology and plant pathology. Separate class sections are arranged for men and women so as to differentiate this work for Agricultural and Home Economics students.

1st Sem. Recitation 1; lab. 1, 2 hrs.; credit 1⅔; fee $2.00.

164. **General Morphology of the Cryptogams.** Structure, development, reproduction, and relationships of the different groups of cryptogams.

6th Sem. Prerequisite 189. Recitations 2; labs. 2, 2 hrs.; credit 3⅓; fee $4.00.

165. **General Morphology of Seed Plants.** Structure, development, reproduction, and relationships of Gymnosperms and Angiosperms.

5th Sem. Prerequisites 164, 124 and 189; recitation 2; labs. 2, 2 hrs.; credit 3⅓; fee $4.00.

180. **Advanced Morphology.** A special study of one or more groups of the plant kingdom, the group or groups selected depending upon the needs of the student.

PROFESSOR MARTIN

7th Sem. Prerequisites 164 or 165; recitations and labs. as arranged; credit 5 or 10; fee $3.00 or $6.00.

189. **Methods in Histology.** Methods of killing, imbedding, sectioning, and staining plant structures.

Either Sem. Prerequisites 128; recitations 1 or 2, 3 hrs.; labs. 1 or 2; credit 2 or 4; fee $3.00 or $6.00.

190. **Research in Morphology.** Special problems.

PROFESSOR MARTIN

Either Sem. Recitations and labs. as arranged; credit 5 or 10; fee $3.00 or $6.00.

192. **Special Morphology of the Fungi.** A special study of the vegetative and reproductive structures of Fungi and their relation to the Algae.

7th or 8th Sem. Prerequisites 128 or 124; recitations 2; labs. 2, 2 hrs.; credit 3⅓; fee $4.00.

196 a, b. **Advanced Plant Embryogeny.** PROFESSOR MARTIN

Either Sem. Prerequisite 124; recitation 1; credit 1.

PLANT PHYSIOLOGY.

268. **Plant Physiology.** Absorption and movement of water; nutrition, growth, movement, and reproduction in plants.

3rd or 6th Sem. Prerequisites 161, Chem. 351, Phys. 205; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5.00.

269. **Plant Physiology.** For Forestry students. Water relations, nutrition, respiration, growth, movement, and reproduction in plants.

2nd Sem. Prerequisites 127, Chem. 103; recitations 2; labs. 2, 2 hrs.; credit 3⅓; fee $5.00.

287. **Plant Physiology.** Water relations, substances manufactured, respiration, growth, movement, and reproduction in plants.

2nd Sem. Prerequisites 161 or 127, Chem. 375; recitations 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00.

290. **Advanced Physiology.** Plant physics and plant chemics.

ASSOCIATE PROFESSOR BAKKE

5th or 7th Sem. Prerequisites 268, Chem. 351, Phys. 205; recitations 2; lab. 3, 3 hr.; credit 5; fee $5.00.

291. **Advanced Physiology.** Plant chemics, growth and movement. Continuation of 290. ASSOCIATE PROFESSOR BAKKE

6th or 8th Sem. Prerequisite 290; recitation 2; lab. 3, 3 hrs.; credit 5; fee $5.00.

292. **Research in Physiology.** Specific problems in plant chemics, plant physics, or growth and movements. ASSOCIATE PROFESSOR BAKKE

Either Sem. Prerequisites 268, Chem. 351, Phys. 205, Bact. 1; recitation 1; labs. 2 or 4, 3 hrs.; credit 3 or 5; fee $3.00 or $5.00.

PLANT PATHOLOGY

304. **Plant Pathology.** Specific problems in the diseases of plants.

PROFESSOR MELHUS

Either Sem. Prerequisites 268, Bact. 1, Zool. 304; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 2 to 10; fee $3.00 or $5.00.

308. **General Plant Pathology of Horticultural Plants.** General introduction to the nature, cause, and remedies of the diseases of horticultural crops.

7th Sem. Prerequisites 268 or 269; recitations 1; lab. 5 hrs.; credit 2⅔; fee $4.00.

309. **Advanced Plant Pathology.** Cultural, physiological, histological and cytological technique as employed in plant pathology. Laboratory

practice in isolation of parasites, germination, inoculation, and carrying stock cultures of plant parasites on the living host in the greenhouse.

PROFESSOR MELHUS

8th Sem. Prerequisites 308, 365, or 366; recitation 1; labs. 2, 3 hr.; credit 3; fee $5.00.

310. **Disease Control.** Principles and practice of disease control. Includes discussion of exclusion, eradication, protection by fungicides, and methods of selection for disease resistance. The composition, preparation, and methods of application of fungicides and their action on host and parasite.

8th Sem. Prerequisite 308, 365, or 366; recitation 1; lab. 1, 3 hr.; credit 2; fee $5 00.

311. **Bacterial Diseases of Plants.** Advanced work in bacterial diseases of plants as to symptoms, environmental influences, host reactions, and laboratory and greenhouse cultural studies

7th Sem. Prerequisites 308, 365, or 366, recitation 1, labs 2, 3 hr, credit 3; fee $5.00.

312. **Common Plant Diseases.** The serious plant diseases that occur on the farm and their control by seed treatment, sanitation, spraying, etc.

5th Sem. Recitation 1; lab 1, 2 hr., credit 1⅔; fee $3 00

365. **General Forestry Pathology.** Principles and practice in plant pathology as they are related to forest trees and their products.

7th Sem Prerequisites 128, 161, 268, or 407, recitations 1; labs 2, 3 hr, credit 3; fee $4 00.

366. **General Plant Pathology of Agronomic Plants.** Important diseases of farm crops; including principles and practice of disease control.

5th or 7th Sem. Prerequisite 161; recitations 1; lab. 2, 3 hr.; credit 3, fee $4 00

367. **Diseases of Special Crops (Advanced).** Designed to meet the demand of advanced students specializing in either horticulture, agronomy, or forestry. Includes special study of the diseases pertaining particularly to the line in which the student is specializing.

PROFESSOR MELHUS, INSTRUCTOR DURRELL

8th Sem Prerequisites 308, 365, or 366, recitation 1, lab 2, 2 hr, credit 2, 4, or 6; fee $3 00 to $5.00.

TAXONOMY

407. **Dendrology.** Families, genera, and species of North American trees, beginning with gymnosperms and ending with angiosperms. A collection of thirty conifers and seventy deciduous trees will be required.

4th or 8th Sem. Prerequisite 127; recitations 2; labs. 2, 3 hr., in lab. and 1, 2 hr. in field; credit 4⅔; fee $4.00.

413 a, b. **Agrostology.** The botanical position and economic uses of important grasses, such as those used in meadows and pastures; cereal food products; grasses in medicine, as soil binders, and for lawn making.

7th or 8th Sem Recitation 1; lab. 1, 3 hr; credit 2; fee $3.00 for each semester

470. **Systematic Spermatophytes.** Flowering plants; historical survey of various systems of classification; study of groups by means of some representatives.

6th or 8th Sem. Prerequisite 161 or 127; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $3.00.

496a. **Research Systematic Botany.** Flowering plants or thallophytes, especially plants of economic importance and those in some way related to agricultural and horticultural problems. PROFESSOR PAMMEL

Either Sem. Prerequisites 189, or 268, Zool 3, Bact. 1; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 5 or 10; fee $3 00 or $5 00.

496b. **Advanced Conference in Systematic Botany.** Some special group of spermatophytes.

7th Sem. Prerequisite 470; recitation 1; lab 6 hrs.; credit 3; fee $3 00.

497. **General Mycology.** The taxonomy, morphology, and phylogeny of the slime molds and fungi (Phycomycetes, Ascomycetes, Fungi Imperfecti, and Basidiomycetes).

7th or 8th Sem. Prerequisites 470 or 189; recitation 1, lab. 2, 3 hr.; credit 3 or 6, fee $4.00.

498. **Advanced Mycology.** Some specific group of the fungi.

PROFESSOR MELHUS

Either semester. Prerequisite 497; recitation 1, labs. 2, 3 hr.; credit 3; fee $4 00.

ECONOMIC BOTANY

500. **Seed Testing.** Impurities of seeds and adulterations, as well as the structures of the seeds. PROFESSOR PAMMEL

Either Sem Prerequisite 470 or 560; recitations 2 or 4; labs. 3 or 6, 3 hr., credit 5 or 10, fee $3.00 or $5 00

501. **Poisonous Plants.** For those pursuing some minor work in chemistry, and those who have some knowledge of general bacteriology.

PROFESSOR PAMMEL

Either Sem Prerequisites 268, Chem 351, Bact. 1, Vet. Phys. 527; recitations 2 or 4, labs 3 or 6, 3 hr , credit 5 or 10; fee $3.00 or $5.00.

514. **Seeds and Seed Testing.** Principal agricultural seeds and weeds, methods of detection of weeds in commercial seeds, and structure and germinative energy of various seeds.

6th or 8th Sem Prerequisite 127 or 161; recitation 1; lab 1, 3 hr , credit 2; fee $3 00.

516. **Poisonous Plants.** Poisonous plants from historical standpoint, with brief history of toxicology, ptomaine poisoning, and poisoning by toxins and other agents—beginning with the poisonous fungi, extending through the higher plants in systematic order. Intended to acquaint veterinarians with the plants responsible for poisoning animals.

2nd Sem. Recitation 1; lab. 1, 3 hr.; credit 2; fee $3.00.

560. **Botany of Weeds.** Injury of weeds to farm, garden, and horticultural crops; origin and distribution of weeds. PROFESSOR PAMMEL

5th or 7th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00.

564. **Range and Poisonous Plants.** Important grasses, poisonous and other plants of the range and forest.

6th Sem. Prerequisite 470; recitation 1; lab 1, 2 hr.; credit 1⅔; fee $2.00.

572. **Microscopic Examination of Foods.** The histological elements of plants such as tissues and cell contents; impurities and adulterations of flour and meal; weed seeds and screenings, oil seeds and oil cake.

6th or 8th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee, $3.00.

588. **Economic Botany.** History and structure, uses, diseases, and systematic relation of cultivated plants. For Home Economics students.

2nd Sem. Prerequisite 161 or 127; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.00.

597. **Applied Botany.** Food plants of man, their economic uses, and their distribution with reference to climatic conditions.

PROFESSOR PAMMEL, MISS HAYDEN

Either Sem. Prerequisites 470 or 366, Econ. 110, Hist. 20; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 5 or 10; fee $3.00 or $5.00.

599. **Microscopial Examination of Foods.** Particular forms of food from a microscopical standpoint. PROFESSOR PAMMEL

Either Sem. Prerequisites 128, Chem. 352, 353, 303; recitations 2 or 4; labs. 3 or 6, 3 hr.; credit 5 or 10; fee $3.00 or $5.00.

HISTORY, SEMINAR, AND THESES

602. **Thesis.** A thesis embodying the results of some special work must be presented four weeks before the close of the year. Candidates in major and minor work must be generally well informed on botanical subjects and should be familiar with botanical literature.

PROFESSORS PAMMEL, MARTIN, MELHUS

Credit 5 or 10; fee $5.00.

623. **Thesis.** Original research in work of any preceding study; laboratory work, preparation of bibliographies, reviewing literature pertaining to the subject, and conferences with those in charge.

Credit 1 to 4; fee $3.00.

681. **Botanical Seminar.** Recent literature and topics of botanical interest are reported and discussed by members of seminar, each member reporting on some assigned topic at least once every two weeks. Lectures are also given by members or by some scientists under the auspices of the seminar.

Each semester. Credit 1.

682a. **Seminar in Plant Pathology.** A discussion of some general problem in plant pathology, literature reviews, and presentation of original investigations. Required of all graduate students majoring in Plant Pathology.

Either Sem. Credit 1, each semester.

682b. **Seminar in Taxonomy.** Review and discussion of the recent literature.

5th or 6th Sem. Credit 1, each semester.

682c. **Seminar in Morphology.** Recent literature and discussion of morphological problems.

Credit 1, each semester.

682d. **Seminar in Physiology.**

8th Sem. Credit 1.

688. **History of Botany.** Lectures.

7th Sem. Prerequisite 161 or 128; recitation 1; credit 1.

## BUSINESS ENGINEERING

Large corporations, contracting firms, municipalities, and all employers of technically trained college men are showing an increasing tendency to transfer such men as have made successes in strictly engineering lines into positions of magnitude and trust requiring knowledge of economic relations and business principles. It is also true that the engineering graduate has the ambition to own and manage a business of his own. Many men with the training secured in our engineering schools combined with the principles of economics and rules of business which they have had to acquire slowly, laboriously, and often at great expense in the school of experience, are meeting with the greatest success in positions which require the highest type of business training and qualifications and a minimum of engineering experience.

From such employers of technically trained men and from engineering graduates now in business for themselves has arisen a demand that the engineering schools offer studies in the fundamental principles of business supplemented with advanced work along lines closely allied with engineering industries. The engineering schools of the country have felt this demand, and many are meeting it in various ways. The problem might be solved most easily by increasing our engineering courses from four to five years, by requiring certain studies related to business during the last two years, and by giving opportunity for free electives. Under present conditions, however, it seems desirable that the studies relating to the fundamentals of business be offered in the regular four-year courses.

The intimate relation which must exist between engineering and business is not a new idea at this college. The engineering courses have been requiring or offering as electives many studies bearing directly or indirectly on business relations. The number of such studies and the quality of the work offered are continually being increased and improved. It is believed that there should be no weakening of the essentially technical and engineering side of the four-year courses. It is probable that the marked success with which many men with engineering training are filling business positions is due to personality and opportunity combined with habits of logical and independent thinking acquired in large part while completing an engineering college course and supplemented by later experience.

A table is submitted below for the benefit of students in engineering or graduates of high schools who are thinking of taking up engineering courses at this college. This table presents in condensed form the studies offered, both required and elective, by departments giving fundamental work pertaining to business engineering.

### English

| | Credits | | Credits |
|---|---|---|---|
| Engl. 116: Exposition | 4 | Engl. 412: Argumentation | 2 |
| Engl. 117: Narration and Description | 3 | Engl. 115: Engineering English | 2 |

## Public Speaking

Pub. Sp 10· Extempore Speech 2
Pub Sp 11: Extempore Speech 2
Pub. Sp 19: Extempore Speech, Debating 1

## History

Hist. 20: Industrial History of U. S. 2
Hist 34· American Government and Politics 3
Hist. 39: History of Labor Problems in the U. S. 2
Hist 40: History of Domestic Commerce 2
Hist 45: History of Foreign Relations of the U S. 3

## Mathematics

Math. 63. Mathematical Theory of Statistics 3

## Psychology

Psy. 10· Psychology of Business 2

## Economic Science

Econ. Sci. 3. Distribution of Wealth 3
Econ Sci. 4: Money and Banking 2
Econ. Sci. 5. Public Finance 2
Econ. Sci. 7· American Labor 2
Econ. Sci. 209 Engineering Economics 3
Econ. Sci. 212: Public Utilities 2
Econ. Sci. 214. Engineering Economics 2
Econ Sci. 219: Business Economics 2
Econ. Sci 326: Business Law 2
Econ Sci 327 Auditing and Accounting 2
Econ Sci 332 Advanced Accounting 2

## Journalism

Jour. 8: Beginning Technical Journalism 2
Jour 9 Technical Journalism Practice 2

## Civil Engineering

C. E. 760· Railway Engineering 2
C. E. 761· Railway Administration 2
C. E. 778 Highway Engineering 2
C E. 612 Roads and Pavements 2
C E. 887 Highway Engineering 2

## Engineering

Engr 702: Specifications and Contracts 1
Engr 801: History of Engineering 1

## Mechanical Engineering

M. E. 809· Power Plant Engineering 3
M. E. 853. Shop Economics 2

## Mining Engineering

Mn E. 816: Mining Engineering 5
Mn E 821 Mine Administration and Mining Law 2

### Architectural Engineering

Arch. E. 824: Elements of Contracting 3

The college is now offering over 100 hours of work preparatory for and fundamental to business careers. Of this total nearly one-third is offered by the Economic Science Department. Students intending to complete four year engineering courses as arranged in this catalogue can, by careful and intelligent selection of electives and options, obtain from twelve to eighteen hours of advanced work along lines fundamental to business success. The student should consult with the Dean of Engineering and the head of his department before taking up such business studies

## CERAMIC ENGINEERING

PROFESSOR BEYER, Engineering Hall, Room 304
Professor Staley

*For information concerning the Division of Engineering, see page 50.*

The Department of Ceramic Engineering was established in response to a growing demand for instruction in the silicate industries. The continued development of the clay working interests and the notable recent expansion of the cement industry have created a demand for technically educated men who are equipped to take the lead in the utilization of the silicate raw materials. Inquiries for qualified men have come from various sources, and at the present time the demand is far greater than the supply.

The term "ceramic engineering" has come to include within its scope the several phases of that branch of engineering which has to do with the investigation and development of all materials which enter into any of the silicate products. Besides clay and cement working, therefore, glass-making, sand-lime brick manufacture, and all mortar work into which natural silicates or silicate forming processes enter are properly embraced in the definition of the word.

The ceramic processes proper are preëminently a phase of chemical engineering and depend upon the principles of technical chemistry. Along with this application of chemical principles must go, however, a thorough familiarity with good mechanical engineering practice and a knowledge of surveying and the principles of electricity, all of which are embodied in the course. The ceramist must possess a knowledge of geology which will enable him to prospect intelligently for raw materials and to take advantage of geological features in their utilization. An acquaintance with metallurgical principles, especially those relating to the value of fuels and their combustion and the properties of slags, is indispensable; for upon the application of this knowledge may frequently depend the success or failure of large enterprises.

It is the design of the course in ceramic engineering to prepare and equip engineers to exploit intelligently deposits of suitable raw materials, to comprehend and apply economical methods to the winning of such materials, to design and put into operation plants for their utilization, and to

take responsible charge of any and all technical processes connected with the manufacture of the finished products. Besides class room, laboratory, and field work, students are required to study the methods employed in some of the leading establishments of the state and are encouraged to spend their vacation in practical work at some of these plants.

## Course in Ceramic Engineering

Leading to degree of Bachelor of Science in Ceramic Engineering.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. 103[1]: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| C. E. 102: Field Work | 2 | C. E. 203: Surveying | 3 |
| Engl. 116: Exposition | 4 | Engl. 117: Narration and Description | 3 |
| Math. 40: College Algebra | 3 | Math. 42b: Plane Trigonometry | 1 |
| Math. 41: Plane Trigonometry | 2 | Math. 43: Plane Analytic Geometry | 4 |
| M. E. 121: Mechanical Drawing | 2 | M. E. 220: Projective Drawing | 2 |
| Mil. Sci. 1: Military Art | 1 | Mil. Sci 2: Military Art | 1 |
| Mn. E. 101: Technical Lecture | R[3] | Mn. E., 220: Technical Lecture | R |
| Phys. Tr. 1 | R | Phys. Tr. 2 | R |
| | 18 | | 18 |

Mn. Engr. 212: Summer Field Work—two weeks R

Students who secure remunerative employment during their summer vacations between the Freshman-Sophomore and the Sophomore-Junior years will be excused from summer field work, provided their employment is for at least a month in length and subject to the approval of the head of the department.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Chem. 157: Quantitative Analysis | 4 | Chem. 158: Ceramic Chemistry | 4 |
| Engl. 412: Argumentation | 2 | Cer. 408: Ceramic Calculations | 1 |
| Math. 44: Calculus | 5 | Math. 45: Calculus | 5 |
| M. E. 322: Mechanical Drawing | 2 | M. E. 401: Mechanics of Engineering | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Mn. Engr. 318: Journal Club | R | Mn. Engr. 419: Journal Club | R |
| Phys. Tr. 3: Phys. Training | R | Phys. Tr. 4: Phys. Training | R |
| Phys. 303: Mechanics and Heat | 5 | Phys. 404: Electricity and Magnetism, Light and Sound | 5 |
| | 19 | | 19 |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.

Mn. Engr. 423: Summer Field Work—two weeks R

Students who secure remunerative employment in the silicate industries during their summer vacation will be excused from summer field work, provided their employment is for at least a month and is subject to the approval of the head of the department.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Cer. 502: Lectures | 5 | Cer. 604: Lectures | 5 |
| Geol. 1: General Geology | 3 | C. E. 656: Structural Engineering | 3 |
| M. E. 502: Mechanics of Engineering | 5 | Engl. 115: Engineering English | 2 |
| M. E. 512: Mechanical Lab. | 1 | Engr. 603: Conservation of Natural Resources | 1 |
| Mn. Engr. 506: Seminar | R | M. E. 613: Mechanical Lab. | 1 |
| Phys. 523: Physical Laboratory | 1 | Mn. Engr. 607: Seminar | R |
| †Mil. Sc. 9: Military Art | 1 | Mn. Engr. 614: Metallurgy | 3 |
| †Specified Electives | 2 | †Mil. Sci. 10: Military Art | 1 |
| | | Phys. 615: Physics Laboratory | 1 |
| | | †Specified Electives | 1 |
| | 18[5] | | 18[5] |

Mn. Engr. 613: Summer Field Work—four weeks R

Junior students who secure instructive employment in one of the great clay-working or cement-manufacturing districts of the country will be excused from the Junior Summer Field Work, provided their employment is for at least six weeks and is subject to the approval of the head of the department.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Cer. 705: Ceramics | 1 | Cer. 806: Ceramics | 4 |
| Cer. 709: Ceramic Design | 4 | Cer. 807: Ceramics | 4 |
| Cer. 710: Ceramics | 4 | Engr. 801: History of Engr. | 1 |
| Engr. 702: Specifications and Contracts | 1 | †Geol. 5: Economic Geology | 4 |
| †Geol. 4: Advanced Geology | 4 | M. E. 809: Power Plant Engineering | 3 |
| Mn. Engr. 708: Seminar | R | Mn. Engr. 809: Seminar | R |
| †Mil. Sci. 11: Military Art | 1 | †Mil. Sci. 12: Military Art | 1 |
| Electives: Specified Electives | 3 | Electives: Specified Electives | 1 |
| | 18[5] | | 18[5] |

Choice of 2 credits from the departments of Engl. Ec. Sci., Pub Sp. Agr'l Jour., Hist., or Mod. Lang.

## Five-Year Work in Ceramics

(Omitted during the period of the war.)

[4] R indicates that the study is required, without credit, for graduation.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Engineering. See Business Engineering, page 131.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

## Description of Studies

| Group | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Ceramics | 408[1], 502, 604, 705, 709, 20 | 619, 710, 806, 807, 21, 711, 815 | 912, 1014 |

20. **Handmade Pottery.** Exercises in designing and modeling simple forms of art pottery. Elective for Junior and Senior students.
Either Sem. Lab. 1 or 2, 3 hr.; credit 1½ or 3, fee $1.50 or $3.00.

21. **Handmade Pottery.** Continuation of 20. Practice in making and using plaster casts; laboratory work in compounding and using simple glazes.
Spring Sem. Labs 1 or 2, 3 hr., credit 1½ or 3, fee $1 50 to $3.00.

408. **Ceramic Calculations.** Problems in the calculation of batches and charges of glasses, glazes, bodies, and cement.
4th Sem. Recitation 1, credit 1

502. **Ceramic Lectures.** Classification, properties, and methods of winning clays and other minerals used in the ceramic industries.
5th Sem Recitations 3, labs 2, 2 hr., credit 5; fee $3.00

604. **Ceramic Lectures.** Manufacture of clay wares, including preparation of clay, formation of the ware, drying and burning.
6th Sem Recitations 3, labs 2, 2 hr; credit 5

619. **Application of Physical Chemistry to the Silicate Industries.**
6th Sem Recitations 2, credit 2.

705. **Ceramics.** Visits to important clay and cement working centers. Careful study and written reports on the plants inspected.
7th Sem Credit 1

709. **Ceramic Design.** Design and laying out of structures and plants for the manufacture of the various ceramic products.
7th Sem. Recitation 1, labs 3, 3 hr., credit 4

710. **Ceramics.** Clay working laboratory Commercial testing, washing, refining of raw clays, compounding of artificial bodies, and formation of wares.
7th Sem Labs 4, 3 hr., credit 4, fee $5 00.

711. **Special Problems in Ceramic Technology.**
Credit 2 to 4, fee $2 00 to $10 00.

806. **Ceramics.** Manufacture and technique of glass, glazes, enamels, cements, and cement products.
8th Sem. Labs. 4, 3 hr; credit 4, fee $5.00

807. **Ceramics.** Thesis.
8th Sem. Recitation 1, labs 3, 3 hr., credit 4, fee $3 00 to $10.00.

815. **Special Problems in Ceramic Technology.** Continuation of 711.
Credit 2 to 4; fee $2 00 to $10 00

912. **Advanced Ceramic Technology.** Research problems in manufacture of crude and fine clay products and wares; investigations of glass making and enameling; geology of clays and other ceramic materials;

[1] The number refers to the description of the study.

microscopic study of raw ceramic materials and finished products; special problems in manufacture of artificial cements. Special ceramics building and laboratories established by the legislature on demand of the clay industries of the state, provide complete equipment for such advanced work. The Iowa field offers excellent opportunities for highly trained ceramic engineers.

PROFESSORS BEYER, STALEY; ASSISTANT PROFESSOR GALPIN

Open for major or minor subjects. Details of classification specially arranged for the individual student. Proper fees charged for laboratory work chosen.

1014. **Advanced Ceramic Technology.** Continuation of 912.

## CHEMICAL ENGINEERING

The work in Chemical Engineering is administered jointly by the heads of the departments of Chemistry and Mining Engineering.

PROFESSOR BEYER, Engineering Hall, Room 304
PROFESSOR COOVER, Chemistry Building, Room 202
ASSOCIATE PROFESSOR MANN, Chemistry Building, Room 78

*For information concerning Division of Engineering, see page 50; for Division of Science, see page 76*

During the last few years a persistent demand has been made by various industries for college graduates who have a thorough training in all branches of chemistry and in certain engineering subjects. This training is necessary for the successful operation of chemical processes on a large scale. In response to this demand the course in chemical engineering has been established

The term "Chemical Engineer," then, signifies a person who has, besides a thorough knowledge of the principles of chemistry, a sufficient acquaintance with the principles of engineering so that the mechanical operations which are so necessary for the commercial success of an industry may have proper attention. It is the joint or interdependent knowledge which the chemical engineer must have.

For a rounded course the chemical engineer must study the various branches of chemistry both theoretical and applied; physics; mechanical drawing and design; mathematics; mechanics and thermo-dynamics, both theoretical and applied; electrical engineering, both in class and laboratory; and chemical engineering. The courses in chemical engineering are for the purpose of illustrating the application of engineering operations to chemical industry as well as of showing the practical applications of chemistry to various industries. Laboratory work is therefore of prime importance. This gives opportunity to verify and apply the principles involved and on a scale large enough so that data of cost and economy of operation may be obtained. The study of English and German as well as of commercial subjects is of considerable importance.

Many industries and industrial processes offer opportunities to the chemical engineer. Some of these are the manufacture of acids and alkalies, hydraulic cements, clay products, porcelain and glass, heavy chem-

icals, medicinal and photographic chemicals, food products, dyes, sugar, paper pulp and paper, explosives; all processes connected with the utilization of fuel by combustion or destructive distillation to form gas, coke, tar, and coal tar products; processes of water purification; the refining of fats and oils and their manufacture into soap; paint and varnish; electrochemical processes; the production of bleach, calcium carbide, fertilizers, ammonia, nitric acid; electrometallurgical operations; metallography of iron and steel and the heat treatment of iron and steel.

This list is indicative of the opportunities awaiting the chemical engineering graduate. The supply of well trained chemical engineers does not nearly satisfy the demand and the field of chemical engineering is constantly widening.

Students pursuing work in engineering can enter the chemical engineering course at any time up to the beginning of the junior year; but in addition to the junior and senior work given below they must take work in chemistry equivalent to chemistry subjects 103, 104, 161, 162, and German to satisfy the requirements.

**Equipment.** The chemical engineering equipment comprises crushing, grinding, separating, and mixing apparatus; distillation and evaporation apparatus, steam and direct heated for vacuum, for atmospheric pressure and for higher pressures; vacuum and pressure filters; extraction apparatus; oil presses; gas and electric furnaces; autoclaves, assay furnace; heating kettles and all of the necessary measuring and testing instruments. A fine analytical is operated in connection with the manufacturing laboratory.

### Course in Chemical Engineering

Leading to the degree of Bachelor of Science in Chemical Engineering.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. Engr. 601[1]: Technical Lecture | R[3] | Chem. Engr. 602: Technical Lecture | R |
| Chem. 103: General Chem. | 4 | Chem. 104: General Chem. and Qualitative Analysis | 4 |
| Engl. 116: Exposition | 4 | Engl. 117: Narration and Description | 3 |
| Math. 40: College Algebra | 3 | Math. 42b: Plane Trigonometry | 1 |
| Math. 41: Plane Trig. | 2 | Math. 43: Plane Anal. Geometry | 4 |
| M. E. 181: Drawing | 1 | M. E. 220: Projective Drawing | 2 |
| Mil. Sci. 1: Military Art | 1 | Mil. Sci. 2: Military Art | 1 |
| *Mod. Lang. 20: Scientific German | 3 | *Mod. Lang. 21: Scientific German | 3 |
| Phys Tr. 1: Phys. Training | R | Phys. Tr. 2: Phys. Training | R |
| | 18 | | 18 |

* Students entering without Mod. Lang. (German) will be required to take German 5a, three credits, first semester and German 6a, three credits, second semester, instead of German 20 and 21.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Chem. Engr. 603: Technical Lecture | R | Chem. Engr. 604: Seminar in Technical German | R |
| Chem. 161: Quantitative Analysis | 4 | Chem. Engr. 690: Municipal Chem. | 3 |
| *Engl. 115: Engineering English | 2 | Chem. 162: Quantitative Analysis | 3 |
| Math. 44: Calculus | 5 | Math. 45: Calculus | 5 |
| M. E. 322: Mechanical Drawing | 2 | M. E. 401: Mechanics of Engr. | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: | R | Phys. Tr. 4: | R |
| Physics 303: Mechanics and Heat | 5 | Physics 404: Electricity and Magnetism, Light and Sound | 5 |
| | 19 | | 20 |

Summer Shop Practice, 170 hours.

* Students offering no German for entrance will be required to take Scientific German in place of Engl. 115.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Chem. Engr. 605: Seminar in German | R | Chem. Engr. 606: Seminar | R |
| Chem. Engr. 670: Chem. Machinery | 3 | Chem. Engr. 641: Industrial Inorganic Chemistry | 3 |
| Chem. 251: Applied Organic | 5 | Chem. 252: Applied Organic | 5 |
| M. E. 502: Mechanics of Engr. | 5 | Engr. 603: Conservation of Natural Resources | 1 |
| M. E. 664: Thermodynamics | 3 | E. E. 663: Applied Electricity | 2 |
| M. E. 512: Mechanical Lab. | 1 | E. E. 664: Laboratory | 1 |
| †Mil. Sci. 9: Military Art | 1 | M. E. 613: Mechanical Lab. | 1 |
| †Electives | 2 | M. E. 704: Appl. Thermodynamics | 3 |
| | | †Mil. Sci. 10: Military Art | 1 |
| | | †Electives* | 2 |
| | 20 | | 19 |

* If. Eng. 115 is not taken in the Sophomore year it is to be taken in place of the sixth semester electives.

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.
† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits |
|---|---|
| Chem. Engr. 607: Seminar | R |
| Chem. Engr. 642: Industrial Organic Chemistry | 3 |
| Chem. Engr. 643: Chemical Manufacture | 2 |
| Chem. Engr. 680: Applied Electro-chemistry | 4 |
| Chem 205: Appl. Physical Chem. | 3 |
| E. E. 765: Appl. Electricity | 2 |
| E. E. 766: Lab. in Appl. Elec | 1 |
| Engr. 702: Contracts and Specifications | 1 |
| †Mil. Sci. 11: Military Art | 1 |
| †Electives | 2 |
| | 19 |

| Eighth Semester | Credits |
|---|---|
| Chem. Engr. 608: Seminar | R |
| Chem. Engr. 644: Chemical Manufacture | 3 |
| Chem. Engr. 696: Thesis | 5 |
| Chem 205: Appl Physical Chem. | 3 |
| Engr 801: Hist of Engineering | 1 |
| †Mil Sci 12: Military Art | 1 |
| †Electives** | 5 |
| | 18 |

Every student is expected to make an inspection trip during the Senior year, which trip will be in charge of a chemical engineering instructor

* Suggested Electives. Agr'l Jour 8 or 9 (2), Ec Sc. 209 (3), Pub Sp 10 or 11 (2), Geol. 7 (4), Chem 257 (2 or 3), Chem Engr 645 or 651 (3), Mn E 715 (4), Bact

** Suggested Electives: Agr'l Jour 8 or 9 (2), Ec Sci 7 (2), Adv. Org Chem, Chem 330 (3⅓), Mn E 614 (3), Geol 8 (3), Bact.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Chemical Engr. | 601[1], 602, 603, 604, 605, 606, 607, 608, 690 | 641, 642, 643, 644, 645, 651, 670, 671, 680, 691, 696 | 681, 801h |

601. **Technical Lectures.** Concerning the field of chemical engineering professional ethics; the elementary chemical and engineering principles applied to chemical industries Three of these lectures are given by the college librarian on the catalog system and the use of the reference library.

1st Sem. Attendance required without credit One hour each week

602. **Technical Lectures.** Continuation of 601.

2nd Sem Attendance required without credit One hour each week

603 **Technical Lectures.** Chemical engineering subjects of present day interest

3rd Sem Attendance required without credit One hour each week

[1] The number refers to the description of the study

† May be omitted by students appointed to the Reserve Officers' Training Corps For full information, see page 270

604. **Technical Reading.** Reading in class of German technical periodicals.

4th Sem. 1 hour required without credit.

605. **Technical Reading.** Continuation of 604.

5th Sem. 1 hour required without credit

606. **Seminar.** Preparation, presentation, and discussion of papers on assigned chemical engineering topics The use of technical literature.

6th Sem 1 hour required without credit

607. **Seminar.** Continuation of 606.

7th Sem 1 hour required without credit

608. **Seminar.** Continuation of 607.

8th Sem. 1 hour required without credit

641. **Industrial Inorganic Chemistry.** General operations common to many chemical industries. Discussions of the more important industries based on inorganic chemistry with reference to the chemistry involved, apparatus used, marketing of the products, utilization of by-products, use of trade journals. Topics: acids and alkalies, salt, chlorine products, glass, pigments, ammonia, commercial fertilizers, potash industry, and electric furnace products.

6th Sem. Lectures or recitations 3; credit 3.

642 **Industrial Organic Chemistry.** Similar to 641 covering the organic field Topics. destructive distillation of coal, wood, bone, and oil, and the products and by-products; fermentation industries; explosives, dyes, paper, medicinal and photographic chemicals, vegetable and animal oils, fats and waxes, soap, sugar, starch, leather, etc.

7th Sem. Lectures or recitations 3; credit 3.

643. **Chemical Manufacture (Inorganic).** Manufacture of technical products of inorganic nature on a large enough scale to afford data for the determination of cost and economy of manufacture. Technical trade journals used. The chemical engineering laboratories are equipped with apparatus similar to that used commercially except that it is of smaller capacity.

7th Sem Labs 2, 3 hrs , credit 2, fee to be arranged.

644. **Chemical Manufacture (Organic).** Continuation of 643.

8th Sem. Labs 3, 3 hr ; credit 3, fee to be arranged.

645. **Assaying.** The analysis of ores and metallurgical products by wet methods and fire assay. Assays of ores, lead, tin, gold, silver, copper, zinc, mercury, bismuth, and antimony; and the assay of bullion.

5th Sem Recitation 1, labs 2, 3 hr , credit 3; deposit $10 00.

651. **Manufacture of Foods.** Use of chemical engineering laboratories for the manufacture of commercial foods. Visits will be made to various food plants in the state.

7th Sem. Recitation 1; labs. 2, 3 hrs., credit 3; fee $7 50

670. **Chemical Machinery.** Principles and materials of construction, operation, and uses of chemical machinery. Visits made to chemical plants and the students required to write reports.

5th Sem. Lectures and recitations 2; lab. 1, 3 hr , credit 3; fee $5.00.

671. **Advanced Chemical Machinery.** Calculations and design of chemical machinery and chemical plants. Prerequisite Chemical Engineering 670.

Either Sem. Recitations 2; credit 2.

680. **Applied Electrochemistry.** Application of the electric current to chemical processes. Laws and phenomena of electrochemistry, primary and secondary batteries, electroplating, electric furnace construction and operation, and the products of electrolysis and of the electric furnace.

7th Sem. Recitations 2; labs. 2, 3 hr.; credit 4; fee $7.50.

681. **Advanced Applied Electrochemistry.** Lectures on the electrochemical industries.

Either Sem. Lectures 2; credit 2

690. **Municipal Chemistry.** The chemical technology of cement, bitumens, oils, fuels, gases, water, sewage, and smoke and their industrial importance.

4th Sem. Recitation 2; lab. 1, 3 hr.; credit 3, fees to be arranged.

691. **Gas Manufacture and Distribution.** The manufacture of illuminating and power gases, such as coal gas, water gas, carburetted water gas, oil gas, producer gas, blau gas, acetylene gas, and gasoline gas and the distribution of these gases.

Either Sem. Lectures 3; credit 3

696. **Thesis.** Special work on an approved topic to be selected before the end of the first semester of the senior year. Taken by students in chemical engineering who have completed the Junior year. Expenses of the thesis are adjusted by special arrangement.

8th Sem. Conferences and library work; labs. 9-12 hours.

RESEARCH

801. **Research.** Research work for graduate students is offered in the following subjects:

a. Applied Inorganic Chemistry, ASSOCIATE PROFESSOR TEST and ASSISTANT PROFESSOR BROWN.

b. Analytical Chemistry, ASSOCIATE PROFESSOR WILKINSON.

c. Applied Physical Chemistry, ASSOCIATE PROFESSOR WILKINSON.

d. Applied Organic Chemistry, ASSOCIATE PROFESSOR RENSHAW.

e. Organic Analysis or Food Analysis; PROFESSOR COOVER and ASSISTANT PROFESSOR BUCHANAN.

f. Agricultural Chemistry, PROFESSOR COOVER.

g. Physiological Chemistry and Nutrition, ASSOCIATE PROFESSOR FOWLER.

h. Chemical Engineering, ASSOCIATE PROFESSOR MANN.

Either Sem.

## CHEMISTRY

PROFESSOR COOVER, Chemistry Building, Room 202

Professor *Bennet; Associate Professors Fowler, Test, *Wilkinson, Renshaw; Assistant Professors *Buchanan, Brown, O'Brien; Instructors *Taggart, Naylor, Storms, Zentmire, Hayes, *Kirk, Kellems, Scoles, Bircher, Sherwood, Wuertz, Rice; Assistants Chapman, Cessna, Williams, White, Brewer, †Banks, Anderson, Waffle, Dielmann, Wright, Warren

*For information concerning the Division of Industrial Science, see page 76.*

The Department of Chemistry occupies a new building which is one of the largest of its kind, having a floor space of one hundred and twenty thousand square feet. It is modern in its arrangement and building equipment. In addition to the large laboratories it contains many special and research laboratories in which a large number of research students may be accommodated. For a full description see Buildings.

The Department is organized to meet the demands for chemical training in a highly technical institution. Its work is therefore comprehensive in extent. It is grouped under the following heads: Inorganic Chemistry and Qualitative Analysis, Analytical, Agricultural, Food and Sanitary, Household, Organic, Technical and Physical Chemistry and Electrochemistry and Physiological Chemistry and Nutrition.

The apparatus for carrying out the above lines of work is complete and new. It is being increased as the developments of the subject demand it.

The following groups are offered:

a. Chemical Technology, Major.

b. Industrial Science with Major in Chemistry.

c. Chemical Engineering (jointly with Department Mining Engineering).

### Chemical Technology — Major

The course in chemical technology is designed to give men the collegiate training desirable for positions as consulting chemists; as superintendents and managers of the factories of the many industries based on chemistry, or which are under chemical control, such as the manufacture of glass, pigments, metal products, illuminating gas, petroleum products, paints and varnishes, oils and fats, soap, sugar, glucose, alcohol and alcoholic beverages, explosives, dyes, paper, leather, fine chemicals, perfumes, drugs, pharmaceutical preparations or foods, etc.; as sanitary chemists; as analytical chemists in government, state, municipal, experiment station, and factory laboratories; as dairy chemists; as agricultural chemists; etc.

[1] The number refers to the description of the study.
* Absent on leave.
† Resigned in November.

### Course in Industrial Science with Major in Chemistry

This course is offered in order to co-operate with other departments of the institution in preparing students for responsible positions in those industries which require fundamental training in other sciences along with intensive training in chemistry. These fields are now assuming considerable importance. Notable examples are found in the demand for bacteriological chemists in the canning, preserving and packing industries and for chemists with special training in the baking, photographic, wholesale food, feed and dairy industries and for water survey and board of health work. This course is also important for training teachers for science work in high schools and colleges.

Graduate work in chemistry is also offered leading to the degrees of Master of Science or Doctor of Philosophy A full description of this work will be found in the graduate bulletin

### Chemical Technology — Major

FRESHMAN YEAR

For Freshman year, see Course in Industrial Science, page 246, which is to be followed, except that Chem 103, 5 hours, and Chem. 104, 5 hours, shall be taken.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Chem. 115: Advanced Inorganic | 3 | Chem 116 Inorganic Chemistry | 3 |
| Chem. 161: Quantitative Anal. | 5 | Chem. 162 Quantitative Anal | 5 |
| Math. 44: Calculus | 5 | Math. 45: Calculus | 5 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys Tr. 3: Phys. Training | R | Phys Tr. 4: Phys Training | R |
| Phys. 303: Mechanics and Heat | 5 | Phys 404: Electricity and Magnetism, Light and Sound | 5 |
| | 19 | | 19 |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Chem 251: Organic | 5 | Chem 252 Organic | 5 |
| Geol. 7: Mineralogy | 4 | Bact. 1. General Bacteriology | 4 |
| M. E. 181: Mechan. Drawing | 1 | M E 220. Projective Drawing | 2 |
| Engl. 412: Argumentation or Engl. 413: Advanced Composition | 2 | †Mil. Sci. 10: Military Art | 1 |
| †Mil. Sci. 9: Military Art | 1 | *Mod Lang. 21: Scien. German | 3 |
| Mod. Lang 20: Scien. German | 3 | Chem. E. 641: Ind. Inorg. Chem. | 3 |
| Seminar | R | Seminar | R |
| †Electives | 2 | †Electives | 3 |
| | 18 | | 18 |

† May be omitted by students appointed to the Reserve Officers Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Chem. 205: Physical | 5 | Chem. 140: History of Chem. | 1 |
| Chem. 257: Qualitative and Quantitative Analysis of Carbon Compounds | 3 | Chem. 208: Electrochemistry | 3 |
| | | Pub. Sp. 10· Extempore Speech | 2 |
| Chem. 303: Food Analysis | 4 | Chem. 330· Sanitary Chem. | 3⅓ |
| Chem. E. 642: Ind. Org. Chem. | 3 | Chem. E. 643: Chem. Mfg. (Inorg.) | 2 |
| †Mil. Sci. 11: Military Art | 1 | †Mil. Sci. 12: Military Art | 1 |
| Seminar | R | Seminar | R |
| †Electives | 2 | †Electives | 5⅔ |
| | 18 | | 18 |

* Students who have credits for Modern Language 21 or the equivalent will elect two hours in each semester of the Junior year.

## Course in Industrial Science—Major Chemistry

For the freshman and sophomore years see the general course in Industrial Science, page 246.

For the junior and senior years the student must fulfill all the requirements as given on page 247.

The student may choose a major along any of the following lines in the chemistry department: agricultural, analytical, food, home economics, industrial, inorganic, organic, physical, physiological, sanitary, and soil chemistry.

To major in chemistry the student must have completed a minimum of thirty-five hours in the department, of which at least twenty must be taken in the junior and senior years.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Inorganic, Elementary Qualitative Analysis | 103a[1], 103b, 104a, 104b, 110, 111 | 115, 116, 140 | 121, 122, 801a |
| Inorganic Analysis | 153, 154, 155, 156, 157, 158, 161 | 162, 163, 164, 170, 173, 180 | 801b |
| Physical and Electro. | 202 | 205, 208 | 215, 216, 801c |
| Organic | | 251, 252, 257, 265, 266, 267, 268, 271, 272 | 801d |
| Organic Analysis, Food and Sanitary Analysis | | 301, 303, 304, 321, 322, 330 | 801e |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | |
|---|---|---|---|
| Agricultural | 351, 352 | 365, 366, 370 | 801f |
| Home Economics | 375, 376, 386 | 380, 381 | |
| Physiological and Nutrition | 403, 408 | 401, 402, 411, 415, 420 | 801g |
| Technical | | 510, 515 | |
| Chemical Engineering | 601, 602, 603, 604, 605, 606, 607, 608 | 641, 642, 643, 644, 645, 651, 670, 671, 680, 691, 696 | 681, 801h |

The following studies in this department have been omitted from the catalogue for the period of the war: 176, 258, 262, 335, 353, 354, 372, 436, and 502.

### INORGANIC CHEMISTRY AND QUALITATIVE ANALYSIS

103 (a). **General Chemistry.** For students who have not had high school chemistry. Principles and the non-metallic elements.

1st Sem. Lectures 2; recitation 1; lab. 1 or 2, 3 hr.; credit 4 or 5; deposit $7.50.

103 (b). **General Chemistry.** For students who have had high school chemistry. Principles and the non-metallic elements discussed in more detail than in (a).

1st Sem. Lectures 2; recitation 1; lab. 1 or 2, 3 hr.; credit 4 or 5; deposit $7.50.

104 (a). **General Chemistry and Qualitative Analysis.** Continuation of 103 (a). The metallic elements, their separation and identification.

2nd Sem. Lecture 1; recitation 1; lab. 2, 3 hr.; credit 4; deposit $10.00.

104 (b). **General Chemistry and Qualitative Analysis.** Continuation of 103 (b). The metallic elements, their separation and identification.

2nd Sem. Lecture 1; recitation 1; lab. 2, 3 hr.; credit 4; deposit $10.00.

Note: All students desiring 5 hours credit in Chem. 103 (a) or (b) or 104 (b) will classify for 2 lectures, 1 recitation and 2, 3 hr. lab. periods.

110. **General Chemistry and Qualitative Analysis.** Home Economics students. Continuation of 103. The metallic elements, their separation and identification.

2nd Sem. Lecture 1; recitation 1; labs. 2, 2 hr.; credit 3⅓; deposit $7 50.

111. **General Chemistry.** Veterinary students. Principles and the more important elements, including the preparation of some of their compounds.

1st Sem. Recitations 3; labs. 2, 3 hr.; credit 5; deposit $10 00.

115. **Inorganic Chemistry.** Principles and theories in detail; the elements, with reference to their periodic classification.

3rd Sem. Prerequisite 104 (a) or (b); lectures 2; lab. 1, 3 hr.; credit 3; deposit $7.50.

116. **Inorganic Chemistry and Preparations.** Continuation of 115.

4th Sem. Prerequisite 115; lectures 1; labs. 2, 3 hr.; credit 3; deposit $10.00.

121. **Advanced Inorganic Chemistry.** Selected topics: atomic theory, periodic law, theories of valency, reactions in non-aqueous solvents,

1 The number refers to the description of the study.

etc. Laboratory work: special methods illustrated by the preparation of typical substances. Lectures or laboratory may be taken separately.

Fall semester. Prerequisite, 205 as parallel; lectures 3; lab. 3, 3 hr.; credits 3 to 6; deposit $10.00 if laboratory is taken.

122. **Advanced Inorganic Chemistry.** Continuation of 121. Lectures or laboratory may be taken separately.

Spring Sem. Prerequisite 205; lectures 3; lab. 3, 3 hr.; credit 3 to 6; deposit $10.00 if laboratory is taken.

140. **History of Chemistry.** The development of chemical knowledge mainly from the biographical standpoint.

Spring Sem. Prerequisite, 2 yrs. of chemistry; lecture 1; credit 1. Offered in 1918-1919.

INORGANIC ANALYSIS

153. **Quantitative Analysis.** Principles and methods applied to materials of interest to electrical engineers, such as coals, fuel gas, boiler water, and the electrolytic determination of metals.

3rd Sem. Prerequisite 104; recitation 1; lab. 1, 3 hr.; credit 2; deposit $7.50.

154. **Quantitative Analysis.** A continuation of 153.

4th Sem. Recitation 1; lab. 1, 3 hr.; credit 2; deposit $7.50.

155. **Quantitative Analysis.** Principles and methods applied to materials of interest to mechanical engineers, such as coals, iron ore, iron, steel, fuel gas, cement, and boiler water.

3rd Sem. Prerequisite 104; recitation 1; lab. 1, 3 hr.; credit 2; deposit $7.50.

156. **Quantitative Analysis.** A continuation of 155.

4th Sem. Recitation 1; lab. 1, 3 hr.; credit 2; deposit $7.50.

157. **Quantitative Analysis.** Principles and methods applied to materials of interest to mining and ceramic engineers, such as coal, limestone, clays, iron and steel, and ores of different metals.

3rd Sem. Prerequisite 104; recitation 1; labs. 3, 3 hr.; credit 4; deposit $10.00.

158. **Ceramic Chemistry.** Continuation of 157. Rational analysis of clays; proximate analysis of coal; flue gas analysis, determination of $B_2O_3$, PbO, and ZnO in glaze.

4th Sem. Recitation 1; labs. 3, 3 hr.; credit 4; deposit $10.00.

161. **Quantitative Analysis.** The theory and practice of elementary gravimetric and volumetric analysis. Required of all students in courses in Applied Chemistry and Chemical Engineering.

3rd Sem. Prerequisite 104; recitations 2; labs. 5 to 9 hrs.; credit 3⅓ to 5; deposit $10.00.

162. **Quantitative Analysis.** A continuation of 161.

4th Sem. Recitations 2; labs. 3 to 9 hrs.; credit 3 to 5; deposit $7.50 or $10.00.

163. **Advanced Quantitative Analysis.** A systematic study of quantitative separations including the rarer elements.

5th Sem. Prerequisite 162; lectures 1; labs. 3 or 6, 3 hr.; credit 4 or 7; deposit $10.00.

164. **Advanced Quantitative Analysis.** Continuation of 163.

6th Sem. Lectures 1; labs. 3 or 6, 3 hr.; credit 4 or 7; deposit $10.00.

170. **Gas and Fuel Analysis.** Technical and exact methods of gas

analysis and the determination of the calorific value of gaseous, liquid, and solid fuels.

4th Sem. Prerequisite, 161, recitation 1, labs 2, 3 hrs; credit 3, deposit $10.00.

173. **Technical Analysis.** One hundred and seventy hours of summer practice in quantitative analysis.

Credit 3½.

180. **Advanced Qualitative Analysis.** From the standpoint of the mass law and equilibrium; includes separation of both common and rare elements.

7th Sem. Prerequisite 161; recitations 2; labs. 2 or 3, 3 hr; credit 4 or 5; deposit $10.00.

PHYSICAL AND ELECTROCHEMISTRY

202. **Photographic Chemistry.** The chemistry of the processes that take place in photography and the purposes of the reagents used. Precedes the study of photography.

3rd Sem. Prerequisites 104; recitation 1; credit 1.

205. **Physical Chemistry.** The properties of gases, liquids, solids, and solutions; thermochemistry, reaction velocity, and equilibrium, with the application to the industries. Required of Chemical Engineers and students specializing in Chemistry Recitations may be taken without the laboratory.

5th or 6th Sem. Prerequisites 161, 252 as parallel, recitations 3, labs 2 or 3, 3 hr. or 3, 2 hr.; credit 3 to 6, deposit $7 50 if laboratory is taken.

208. **Electrochemistry.** The theories of electrochemistry and the chemical reactions brought about by the use of the electric current.

4th Sem. Recitations 2; lab. 1, 3 hr.; credit 3; deposit $5.00.

215. **Advanced Physical Chemistry.** Special topics A discussion of chemistry of industrial processes based upon the phase rule and the theorem of LeChatelier. Lectures, conferences, and laboratory work Lectures may be taken without laboratory.

Fall Sem. Prerequisite 208; lectures 2; labs. 3, 3 hr; credit 2 or 5; deposit $10.00 if laboratory is taken.

216. **Advanced Physical Chemistry.** Continuation of 215.

Spring Sem. Lectures 2; labs. 3, 3 hr., credit 2 or 5; deposit $10 00 if laboratory is taken.

APPLIED ORGANIC CHEMISTRY

251. **Organic Chemistry.** General study, designed to meet the requirements of chemists, chemical engineers, and students specializing in the applied biological sciences and medicine.

3rd Sem. Prerequisite 104; lectures 2; recitation 1, labs. 2, 3 hr; credit 5; deposit $10.00.

252. **Organic Chemistry.** Continuation of 251.

4th Sem. Prerequisite 251, 351, or 375; lectures 2; recitation 1; labs. 2, 3 hr.; credit 5; deposit $10.00.

257. **Qualitative and Quantitative Analysis of Carbon Compounds.**

5th Sem. Prerequisite 252; lecture 1; labs. 1 or 2, 3 hr.; credit 2 or 3; deposit $7.50 or $10.00.

265. **Advanced Organic Chemistry.** An extended and systematic treatment of the simpler classes of carbon compounds with appropriate discussions on the theories of reactions.

5th Sem. Prerequisite 252; lectures 2; credit 2.

266. **Advanced Organic Chemistry.** Continuation of 265.

6th Sem Lectures 2, credit 2

267. **Critical Study of Methods and Apparatus for the Preparation of Carbon Compounds.** Extraction, distillation, filtration, etc. Apparatus designing, reduction, oxidation, nitronation, sulfonation, esterification, etc.

5th Sem. Prerequisite 252; lectures and demonstrations 2; credit 2.

268. **Special Topics in Organic Chemistry.** Three or more topics selected from the following: theories of reactions, the carbohydrates, proteins, terpenes, heterocyclic compounds, alkaloids, and dyestuffs.

6th Sem. Prerequisite 252; lectures 2; credit 2.

271. **Advanced Organic Chemistry.** A laboratory study in the synthesis and preparation of a number of carbon compounds of interest in the arts and industries, including dyestuffs, perfumes, and drugs. Opportunity will be given for gaining experience in a variety of laboratory methods.

Fall Sem. Prerequisite 252; labs. 3 to 5, 3 hr.; credit 3 to 5; deposit $10.00.

272 **Advanced Organic Chemistry.** Continuation of 271.

Spring Sem. Prerequisite 265; labs. 3 to 5, 3 hr.; credit 3 to 5; deposit $10.00.

### FOOD AND SANITARY CHEMISTRY

301. **Food Chemistry.** The origin, composition, and manufacture of foods.

5th Sem Prerequisite 351 or 375; lectures 3; credit 3. Offered in 1917-1918.

303. **Food Analysis.** Methods of analysis of animal and vegetable foods, including tests for adulterants, preservatives, and coloring matters; and methods of organic analysis. A discussion of food legislation and standards of purity

5th or 6th Sem. Prerequisite 352 or 376; lectures 2; labs. 1½ or 4½, 2 hr.; credit 3 or 5; deposit $7.50 or $10.00.

304. **Advanced Organic Analysis.** Continuation of the organic analysis of subject 303.

6th Sem. Prerequisites 303 and 252; lectures 2; labs. 1½ or 4½, 2 hr.; credit 3 or 5, deposit $7.50 or $10.00. Offered in 1918-1919.

321. **Dairy Chemistry.** Analysis of pure dairy products; a qualitative and quantitative analysis of adulterated products and the detection of the preservatives and coloring matters commonly used.

5th Sem. Prerequisite 352; recitations 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

322. **Advanced Dairy Chemistry.** The chemical changes which occur during the process of manufacture of the various dairy products and methods of food inspection and analysis. Analytical work will take up some of the more advanced methods of analysis of dairy and general food products.

6th Sem. Prerequisite 353 or 321; lectures 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

330. **Sanitary Chemistry.** Methods of water and sewage analysis, water softening and purification.

6th Sem. Prerequisite 161 or 352; lectures 2; labs. 2, 2 hr.; credit 3⅓; deposit $7.50.

AGRICULTURAL CHEMISTRY

351. **Applied Organic Chemistry.** Physical and chemical properties and methods of preparation of important classes of organic compounds; the composition of plant and animal bodies; the proximate principles of foods, the chemical changes which occur during digestion, and the elements of nutrition.

3rd Sem. Prerequisite 104; lectures 3; lab. 1, 2 hr.; credit 3⅔; deposit $6.00.

352. **Agricultural Analysis.** Principles of gravimetric and volumetric analysis; the analysis of milk, grain, and mill feeds and fodders.

4th Sem. Prerequisite 351; lectures and recitations 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

365. **Analysis of Soils and Fertilizers.** Designed especially for those students in agronomy or animal husbandry who wish to continue the work begun in 352 in fertilizers and soil analysis.

5th Sem. Prerequisite 352; lectures 2; labs. 3, 2 hr.; credit 4; deposit $10.00.

366. **Chemistry of Soils.** The most recent investigational work on soil chemical methods. Research problems.

6th Sem. Prerequisite 162, 365, 252; lectures 2; lab. 5, 2 hr.; credit 5⅓; deposit $10.00.

370. **Chemistry of Forest Products.** A brief outline of the chemistry of plant growth followed by a study of the preparation and utilization of the chemical products obtained from the forest.

6th Sem. Prerequisite 351; lectures 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

HOUSEHOLD CHEMISTRY

375. **Applied Organic Chemsitry.** Consideration of organic chemistry with special reference to Home Economics. Study, estimation, and preparation of some of the more important compounds. Serves as a foundation for physiological chemistry.

3rd Sem. Prerequisite 110; lecture 2; recitation 1; labs. 2, 2 hr.; credit 4⅓; deposit $10.00.

376. **Food Chemistry.** Constituents entering into composition of foods with quantitative estimation. Methods of analysis of foods: milk, butter, olemargarine, ice cream, cereal foods; detection of coloring matters and food preservatives.

4th Sem. Prerequisite 375; lectures 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

380. **Textile Chemistry.** Detailed study of the chemical nature of the fibers; adulteration of fabrics; technical testing of yarns and fabrics; chemistry of dyeing.

5th and 6th Sem. Prerequisite 386; recitation 2; labs. 2, 2 hr., credit 3⅓; deposit $10.00.

381. **Advanced Textile Chemistry.** Quantitative analysis of fabrics; discussion of textile legislation and government standards. Consideration of some present problems in textile adulteration.

8th Sem. Prerequisites 380; recitation 2; labs. 2, 2 hr.: credit 3⅓; deposit $10.00.

386. **Elementary Textile Chemistry.** The physical and chemical nature of the fibers; methods of qualitative analysis of fabrics and their application in the household; chemistry of cleaning.

4th Sem. Prerequisite 375; recitation ½ hr.; lab. 1, ½ hr.; credit 1; deposit $3.00.

### PHYSIOLOGICAL CHEMISTRY

401. **Physiological Chemistry and Nutrition.** For students who desire to obtain a thorough grounding in the principles of physiological chemistry and nutrition. In conjunction with Chemistry 402 it covers fully the chemistry of digestion, assimilation, and metabolism of the organic and inorganic constituents of the food, and the secretions and excretions of the animal body with special reference to their normal and pathological significance.

5th Sem. Prerequisite Organic Chem. and Quantitative Analysis; lectures 3; labs. 2, 3 hr.; credit 3 to 5; deposit $10.00.

402. **Physiological Chemistry and Nutrition.** Continuation of 401.

5th Sem. Prerequisite 376; lecture 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

403. **Physiological Chemistry.** Home Economics students. Chemistry of the human body. its food, organic and inorganic, and the changes which these undergo during the process of nutrition.

5th Sem. Prerequisite 376; lecture 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

408. **Bio-Chemistry for Veterinary Students.** Introductory work in organic chemistry followed by physiological chemistry. Chemical changes in the living animal body, the essential composition of animal foods, and the changes through which foods pass in the animal economy.

2nd Sem. Prerequisite 111; lectures 2; recitation 1; labs. 2, 3 hr.; credit 3 to 5; deposit $10.00.

411. **Plant Chemistry.** The bio-chemistry of plant products and their chemical composition.

5th or 6th Sem. Prerequisite, Organic Chemistry; recitations 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

415. **Special Problems.** Advanced instruction in physiological chemistry along lines closely associated with dietetics, experimental veterinary medicine, animal nutrition, bacteriology, etc.

7th or 8th Sem. or both; prerequisite 402 or 420; conference 1; lab. 2, 3 hr. or more; credit 3 or more; deposit $10.00.

420. **Metabolism and Human Nutrition.** Nutrition of the human body with special reference to dietetic problems.

6th Sem. Prerequisite 403; lecture 2; labs. 2, 3 hr., or 3, 2 hr.; credit 3 to 5; deposit $10.00.

### TECHNICAL CHEMISTRY

510. **Metallography.** Thermal analysis and constitution of iron, steel, and other alloys.

6th Sem. Prerequisite, elementary quantitative chemistry; recitation 1; labs. 2, 3 hr.; credit 3; deposit $10.00. Offered in 1918-1919.

515. **Calorimetry.** Methods for determining the heat values of solid, liquid, and gaseous fuels.

7th Sem. Prerequisite, elementary quantitative chemistry; labs. 2, 3 hr.; credit 2; deposit $10.00. Offered in 1919-1920.

## CIVIL ENGINEERING

*Professor Marston

Professor Kirkham, Engineering Hall, Room 311

Professors King, *Agg; Associate Professors *Ford, Crum, Nichols, Dodds; Assistant Professor *Baughman; Instructors Clemmer; Instructors Hastings, Pochel; Mechanician Smith

*For information concerning the Division of Engineering, see page 50*

Civil Engineering includes Bridge Engineering, Railroad Engineering, Highway Engineering, City Engineering, Sanitary and Water Supply Engineering, Hydraulic Engineering, Irrigation and Drainage Engineering. These fields deal with the construction of all types of steel and concrete structures, such as bridges, office buildings, dams, etc ; the surveying and construction of roads, tunnels, and railways; coast and geodetic surveying; harbor and river construction; and many other kinds of construction and survey.

The course in Civil Engineering is planned to serve two purposes. The first of these is to give the student such thorough training in the exact sciences, such as mathematics, physics, and chemistry, as will develop an ability to analyze and solve the complex problems that will present themselves when he enters the practice of civil engineering Not only are these subjects invaluable in developing mental resourcefulness, but they are fundamental to all engineering knowledge.

The second purpose of the course is to equip the student with a working knowledge of those subjects that are the everyday tools of the civil engineer. These include drawing, surveying, the testing of materials of construction, the principles of design of structures, and the store of knowledge collected in hand books and reference works.

Civil engineering has expanded until it includes many quite specialized lines of endeavor. Although clearly defined professions in themselves, still they are largely interdependent and require the broad fundamental principles of civil engineering. For this reason the required course of study includes the essential work in each branch of civil engineering which will provide these broad fundamental principles However, opportunity is afforded good students to elect additional work in any of the special branches in which they have special interest

The instruction in drawing gives the student such facility as will enable him to do creditable work in an engineering drafting office. Especial attention is paid to the lettering of all drawings made in connection with his professional work. The student is required to letter plainly and neatly and to make finished plates. Throughout the Sophomore, Junior, and Senior years the student is given practice in the preparation of maps and of drawings and plans of various engineering structures.

By actually using them, the student is familiarized with the various instruments and methods employed in field surveying. Starting with the

* On leave of absence for Military Service

simplest problems—pacing, ranging, chaining, and compass work—he gradually advances to the use of the transit, level, and other instruments of greater accuracy and delicacy. By practice in the field he becomes familiar with land surveying, leveling, topographic surveying, geodetic surveying, and railroad surveying. It is the aim of this part of the course to give the student that facility in the handling of instruments and in the carrying out of operations in field surveying which can only be acquired by much practice. He is given experience in the handling of small parties of men.

In addition, all civil engineering students are required to spend two weeks in the field on engineering practice during both the Sophomore and Junior summer vacations, under the direction of members of the civil engineering faculty. In lieu of this, students are urged to obtain employment with competent engineers or contractors. Such work, when properly certified to by the employer, will be accepted as credit for the required engineering practice.

General instruction in engineering practice and in the spirit of the profession is given in courses of technical lectures in the Freshman year.

Besides the work as given in the outlined course of study, the student in civil engineering gains a part of his experience and training by inspection of engineering works on inspection tours required of the upper classmen. In the Junior year at least one trip is made to some industrial center in Iowa. In the Senior year the students go to Chicago, Milwaukee, Gary, or other important industrial community where various engineering works can be inspected and their construction features noted.

The students also obtain valuable information through lectures given by practicing engineers who are invited by the College to speak upon the subjects in which they are experts.

The course finally culminates in a thesis, on some original investigation carried on by the student to demonstrate his ability to do such work. As a rule much time has been devoted to this work in the past, and the results have often been found worthy of publication.

## Course in Civil Engineering

Leading to the degree of Bachelor of Science in Civil Engineering. For professional degree, see page 61.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| C. E. 102[1]. Field Work | 2 | C. E. 236: Surveying | 2 |
| C. E. 141: Technical Lecture | R[3] | C E. 242: Technical Lecture | R |
| C. E. 181: Drawing | 2 | C. E. 264: Descriptive Geometry | 3 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Engl. 116: Exposition | 4 | | |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

| | |
|---|---|
| Math. 40: College Algebra | 3 |
| Math. 41: Plane Trigonometry | 2 |
| Mil. Sci. 1: Military Art | 1 |
| P. T. 1: Phys. Tr. | R |
| | 18 |

| | |
|---|---|
| Engl. 117: Narration and Description | 3 |
| Math. 42a: Plane and Spherical Trigonometry | 1 |
| Math. 43: Plane Analytical Geometry | 4 |
| Mil. Sci. 2: Military Art | 1 |
| P. T. 1: Phys. Tr. | R |
| | 18 |

SOPHOMORE YEAR

Third Semester

| | Credits |
|---|---|
| C. E. 307: Working Drawings | 1 |
| C. E. 308: Surveying | 4 |
| C. E. 343: Seminar | R |
| Engl. 412: Argumentation | 2 |
| Math. 44: Calculus | 5 |
| Mil. Sci. 3: Military Art | 1 |
| P. T. 3: Physical Tr. | R |
| Phys. 303: Mechanics and Heat | 5 |
| | 18 |

Fourth Semester

| | Credits |
|---|---|
| C. E. 405: Topographical Drawing | 1 |
| C. E. 409: Surveying | 2 |
| C. E. 444: Seminar | R |
| Math. 45: Calculus | 5 |
| M. E. 401: Mechanics of Engineering | 3 |
| Mil. Sci. 4: Military Art | 1 |
| P. T. 4: Phys. Tr. | R |
| Phys. 404: Electricity and Magnetism, Light and Sound | 5 |
| Phys. 423: Physical Laboratory | 1 |
| | 18 |

SUMMER WORK

| | Credits |
|---|---|
| C. E. 432: Engineering Practice | 2 |

JUNIOR YEAR

Fifth Semester

| | Credits |
|---|---|
| C. E. 510: Railway Engineering | 5 |
| C. E. 514: Cement and Masonry Laboratory | 1 |
| C. E. 527: Seminar | R |
| C. E. 563: Materials of Construction, or | 2 |
| †C. E. 553: Materials of Construction | 2 |
| †E. S. 214: Engineering Economics | 2 |
| | 3 |

Sixth Semester

| | Credits |
|---|---|
| C. E. 612: Roads and Pavements | 2 |
| C. E. 615: Structural Laboratory | 1 |
| C. E. 617: Structural Engineering | 4 |
| †C. E. 623: Materials of Construction | 2 |
| †Eng. 603: Conservation of Natural Resources | 1 |
| | 3 |
| C. E. 628: Seminar | R |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | |
|---|---|---|---|
| †Mil. Sci. 9: Military Art | 1 | C. E. 639: Railway Engineering | 3 |
| †Geol. 3: Engineering Geology | 3 | †Engl. 115: Engineering English | 2 |
| M. E. 588: Mechanics of Engineering | 5 | †Mil. Sci. 10: Military Art | 1 |
| | | M. E. 660: Hydraulics | 3 |
| | 19 | | 19 |

SUMMER WORK

| | Credits |
|---|---|
| C. E. 633: Engineering Practice | 2 |

SENIOR YEAR

| Seventh Semester | | Eighth Semester | Credits |
|---|---|---|---|
| C. E. 716: Hydraulic Laboratory | 1 | | |
| C. E. 729: Seminar | R | C. E. 830: Seminar | R |
| C. E. 738: Concrete Structures | 3 | C. E. 845: Sewerage | 3 |
| C. E. 750: Structural Engineering | 4 | C. E. 869: Structural Engineering | 4 |
| C. E. 755: Water Supply | 2 | C. E. 895: Concrete and Masonry Structures | 3 |
| C. E. 752: Hydraulic Engineering | 4 | Choice: A. E. 31: Drainage and Irrigation | 2 |
| C. E. 790: Highway Design | 2 | Choice: C. E. 894: Valuation of Engr. | 2 |
| †C. E. 725: Thesis | R | Choice: C. E. 896: City Management | 2 |
| †C. E. 779: Road Materials Lab. | 1 | †C. E. 871: Thesis | 2 |
| †Eng. 702: Spec. and Contracts | 1 | †Mil. Sci. 12: Military Art | 1 |
| †Mil. Sci. 11: Military Art | 1 | Eng. 801: History of Engineering | 1 |
| | | M. E. 889: Power Engineering | 3 |
| | 19 | | 19 |

## Five-Year Course in Civil Engineering

(Omitted during the period of the war.)

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| General | 141[1], 242, 343, 444, 527, 628, 725, 729, 830, 871 | | |
| Drawing | 101, 181, 264, 307, 366, 405 | | |

[1] The number refers to the description of the study.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | |
|---|---|---|---|
| Surveying, Geodesy, Astronomy | 102, 203, 236, 288, 304, 308, 391, 406, 409, 432, 451, 486, 557, 633, 658 | | |
| Structural Materials, Masonry Construction, Experimental Engineering, and Special | 865<br>635, 894 | 514, 553, 614, 615, 623, 653, 659, 713, 716, 865 | 1110 |
| Railway Engineering | | 510, 639, 754, 760, 761, 862 | 1108 |
| Structural Engineering and Concrete and Masonry Design | | 617, 626, 656, 718, 738, 746, 747, 750, 773, 774, 822, 848, 849, 869, 880, 881, 882, 883, 895 | 1109 |
| Highway Engineering | | 612, 778, 779, 877, 883, 887, 790 | 1112 |
| Hydraulic and Sanitary Engineering | | 719, 746, 752, 755, 792, 794, 840, 845, 877 | 1111 |
| City Management | | 896 | |

The following studies in this department have been omitted from the catalogue for the period of the war 489, 524, 531, 621, 634, 636, 721, 837, 884, 885.

101 **Free Hand Lettering** Exercises in the formation of such styles of free hand lettering as are suitable for use on the drawings of the engineer or architect. Regular for Architectural Engineers Elective for others; varied to meet the needs of the student.

1st Sem. Lab. 1, 3 hr ; credit 1.

102. **Field Work**. Pacing, ranging, chaining; uses of the compass, hand level, level and transit; field methods, duties of the members of a field party, keeping of field notes; calculations and office work. Gives the student sufficient experience to enable him to fill a position as chainman or rodman, and to make use of the common surveying instruments, during summer vacation.

1st Sem. Labs. 2, 3 hr ; credit 2; fee $2.00

141. **Technical Lecture**. On the civil engineering profession, including definitions and general discussion of engineering, the different branches of civil engineering, and general discussion of each; the ideals of the profession; the reading of current literature and other general civil engineering topics of interest to young men entering the profession.

1st Sem. Lecture 1; required.

181. **Drawing**. Free hand lettering as applied to engineering drawing. Use and care of drafting instruments, with the preparation of exercises and simple drawings.

1st Sem. Labs. 2, 3 hr.; credit 2.

[a] In the Junior, Senior, and Post-Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Engineering.

203. **Surveying.** Care, uses, and adjustments of the transit and level; measurement of angles; traversing; the stadia; U. S. land subdivision; calculations; office work; field methods; keeping field notes. Taken by Mining Engineering students.

**2nd Sem. Prerequisites 102 and Math. 41; recitation 1; labs. 2, 3 hr.; credit 3; fee $3.00.**

236. **Surveying.** The care and uses of surveying instruments; field methods; forms of notes; calculations and office work. Field practice in elementary transit and level work.

**2nd Sem. Prerequisites 102 and Math. 41; must be followed by 308 and 409; recitation 1; labs. 1, 3 hr.; credit 2; fee $2 00.**

242. **Technical Lecture.** A continuation of 141 Three lectures are given by College librarians in explanation of the card catalogue system and the use of reference books.

**2nd Sem. Lecture 1; required.**

264. **Descriptive Geometry.** The theory of projection as applied to engineering drawing. Covers the principles of descriptive geometry, including oblique, isometric, orthographic, and perspective projection; shades and shadows; intersections and developments.

**2nd Sem. Prerequisite 181 or Arch. E. 113; recitation 1, labs. 2, 3 hr.; credit 3.**

288. **Surveying.** Pacing; chaining; the care and uses of the level and transit, duties of members of field parties; keeping of field notes. Field work. Taken by Architectural Engineers.

**2nd Sem Prerequisite Math. 41 and classification in Math. 42; must be followed by 391, recitation 1, lab 1, 3 hr, credit 2; fee $2.00.**

304 **Surveying.** Pacing; ranging; chaining; care, uses, and adjustments of the transit and level; angle measurement; traversing; leveling; land surveying; U. S. land subdivision; calculations and office work. Taken by Agricultural Engineers.

**3rd Sem Prerequisite, Math. 42b; must be followed by 486; recitation 1; labs. 2, 3 hr; credit 3; fee $3.00.**

307. **Working Drawings.** Drafting-room conventions; dimensioning; machine sketching; the preparation of detail and assembly drawings of small machines, and working drawings of engineering structures.

**3rd Sem. Prerequisite 181; lab. 1, 3 hr.; credit 1.**

308. **Surveying.** A continuation of 236. Adjustments and uses of the transit and level; U. S. land subdivision; taking topography; city surveying. Field work.

**3rd Sem. Prerequisite 236; must be followed by 409; recitations 2; labs. 2, 3 hrs.; credit 4; fee $3.00.**

343. **Seminar.** See 830.

**3rd Sem. Required.**

366. **Topographical Drawing.** Practice in the formation and use of topographical symbols, as rendered in ink and water colors, and the preparation of topographical maps. Taken by Foresters.

**3rd Sem. Lab. 1, 3 hr.; credit 1.**

391. **Field Work.** Continuation of 288

**3rd Sem. Prerequisite 288; lab. 1, 3 hr.; credit 1; fee $2.00.**

405. **Topographical Drawing.** Formation and use of topographical symbols, and the preparation of profiles, plats, and topographical maps, which are worked up from data taken in the regular field work of 308 and 409.

4th Sem. Prerequisites 181 and 308; 409 must be taken at the same time or previously; lab. 1, 3 hr.; credit 1.

406. **Surveying.** Pacing, ranging, chaining, uses of the forest service compass and other simple instruments. A good general foundation for the work of the following summer in camp. Taken by Foresters.

4th Sem. Prerequisite, Math. 30; must be followed by 557 and 658; labs. 2, 3 hr.; credit 2; fee $2.00.

409. **Surveying.** Continuation of 308. Mine surveying; hydrographic surveying; determination of meridian; precise leveling; elementary triangulation. Field work.

4th Sem. Prerequisite 308; recitation 1; lab. 1, 3 hr.; credit 2; fee $2.00.

432. **Engineering Practice.** Two weeks' engineering work under actual working conditions. See 633 for general description.

4th Sem. Credit 2.

444. **Seminar.** See 830.

4th Sem. Required.

451. **Surveying.** Pacing; ranging; chaining; the care, uses, and adjustments of the transit and level; measurement of angles; traversing; the stadia; U. S. land subdivision; calculations and office work; field methods; keeping field notes. Elective for students not taking Surveying in their regular course.

3rd and 4th Sem. Prerequisite, Math. 41 or 17; recitation 1; labs. 2, 3 hr.; credit 3; fee $3.00.

486. **Surveying.** A continuation of 304. Taken by Agricultural Engineers.

4th Sem. Prerequisite 304; recitation 1; labs. 2, 3 hr.; credit 3; fee $3.00.

510. **Railway Engineering.** Class and field exercises in simple, reverse, and transition curves, and in wyes and yards; earthwork; haul and mass diagram; train, grade, and curve resistance; rise and fall; pusher grades; tonnage rating; virtual profits.

5th Sem. Prerequisites 181, 308, and 409; recitations 3; labs. 2, 3 hr.; credit 5; fee $3.00.

527. **Seminar.** See 830.

5th Sem. Required.

553. **Materials of Construction.** Concrete and masonry materials manufacture, preparation, properties and uses of cements, sand, gravel, stone, plain concrete, clay products, etc. Should be taken in conjunction with C. E. 514 or 614.

5th Sem. Must be accompanied by M. E. 588 or 502; recitation 2; credit 2.

557. **Surveying.** The use of the compass, level, transit, and plane table; angle measurement; traversing; leveling; U. S. land subdivision; retracement surveys; observations for meridian; taking topography; calculations and office work. Taken by Forestry students.

5th Sem. Prerequisite 406; must be followed by 658; recitations 2; labs. 2, 3 hr.; credit 4; fee $3.00.

563. **Materials of Construction.** Use, manufacture, and testing of the various materials of construction, including sand, gravel, cement, stone, brick, concrete, iron, steel, and other metals.

5th Sem. Must be accompanied by M. E. 502 or 588; recitations 2; credit 2.

612. **Roads and Pavements.** Types of roads and pavements, methods of construction and maintenance, special machinery, costs, comparisons of types. Open only to Juniors and Seniors.

6th and 7th Sem. Recitations 2; credit 2.

614. **Cement and Masonry Laboratory.** Same as 514; regular for students in Architectural Engineering. Students from other courses desiring to elect work in Cement Laboratory should classify in this course.

6th Sem. Prerequisites 553 and M. E. 588; lab. 1, 3 hr.; credit 1; fee $3.00.

615. **Structural Laboratory.** Physical properties and action of materials of construction under stress. Special study of the properties of iron, steel, and wood. Standard tests as well as experiments to verify theoretical laws.

5th and 6th Sem. Prerequisites 553 or 563 and M. E. 588, or to be accompanied by 653 or 628; lab. 1, 3 hr.; credit 1; fee $3.00.

617. **Structural Engineering.** Class work: theory and design of railroad bridges and viaducts. Drawing room work: the designing of railroad bridges. including beam bridges, deck and through plate girder spans and viaducts; the making of stress sheets and complete detail drawings, shop bills, etc.

6th Sem. Recitations 2; labs. 2, 3 hr.; credit 4.

623. **Materials of Construction.** Continuation of course 553. Timber and metallic materials.

6th Sem. Prerequisite M. E. 588 or 502; recitation 2; credit 2.

626. **Structural Engineering.** For students taking Architectural Engineering. Analytical and graphical determination of stresses in beams, girders, and trusses; the designing of beams, girders, trusses, and towers. General drawings are made and for some of the problems complete working drawings are required.

6th Sem. Recitations 3; labs. 2, 3 hr.; credit 5.

628. **Seminar.** See 830.

6th Sem. Required.

633. **Engineering Practice.** Two weeks' practical engineering field work under faculty direction, during summer vacation immediately preceding classification. 432 and 633 required of all Civil Engineering students. Credit for either course may be obtained on presentation of a certificate showing completion of four consecutive weeks of satisfactory engineering work under a competent engineer. Credit in both subjects during one summer will require four weeks each of two distinct classes of engineering work. Active assistance will be rendered students in securing summer engineering employment.

6th Sem. Credit 2.

635. **Engineering Computations.** Methods of computation; checking; short cuts; the use of logarithms and other tables; the use of slide

rules and mechanical computing machines; the use of the planimeter; the construction and use of graphical diagrams.

5th and 6th Sem. Prerequisite 181, Math. 41, 42a and 43; recitation 1; lab. 1, 3 hrs.; credit 2.

639. **Railway Engineering.** Specifications for grading; earthwork; rockwork; tunneling; timber and trestle bridges; track materials; tie and timber treating; estimates; bridge and station surveys; curve realignment; ballast stakes.

6th Sem. Prerequisite 510; recitations 2; lab. 1, 3 hr.; credit 3; fee $1.00.

653. **Materials of Construction.** Use, manufacture, and testing of various materials of construction including sand, gravel, cement, stone, brick, concrete, iron, steel, and other metals. For students in Agricultural Engineering.

6th Sem. Prerequisites or classification in M. E. 502 or 588; recitations 2; credit 2.

656. **Structural Engineering.** For students taking Mining, Mechanical, or Electrical Engineering. The theory and designing of ordinary steel and reinforced concrete mill buildings, machine supports, transmission towers, head frames, highway bridges, etc. General drawings and some complete working drawings are required.

6th Sem. Recitations 2; lab. 1, 3 hr.; credit 3.

658. **Surveying.** A continuation of 557. Taken by Foresters.

6th Sem. Prerequisite 557; recitations 2; labs. 2, 3 hr.; credit 4; fee $3 00.

659. **Timber Testing.** Tests of the properties of timber as a structural material, and comparative tests of the different species. The methods used by the United States Forestry Products Laboratories will be used. For students in Forestry.

6th or 8th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $4.00.

713. **Inspection Engineering** Construction materials; the work of a superintendent of construction; inspection of construction; workmanship and materials; laying out work; inspection and reports on existing structures and projects.

7th Sem. Prerequisites 553 (or 653), 514, 623, and 615; lecture 1; credit 1.

716. **Hydraulic Laboratory.** Tests of laws of theoretical hydraulics, determination of the coefficients to apply to the theoretical formulae for discharge, pressure, and velocity. Efficiency tests of hydraulic machines, including hydraulic rams, pumps, and water motors.

7th Sem. Prerequisite M. E. 660; lab. 1, 3 hr.; credit 1; fee $3.00.

718. **Advanced Reinforced Concrete Design.** For students wishing to elect additional work in reinforced concrete construction. The designing of foundations, buildings and arch bridges, considering theory of design, aesthetics, and details.

7th Sem. Lecture 1; lab. 1; credit 2.

719. **Water Purification, Sewage Treatment, and Municipal Wastes Disposal.** Methods and devices for the removal of impurities in water supplies; processes and structures employed in sewage treatment; and the

collection and disposal of garbage and other city wastes. Elective for students wishing additional work in Sanitary Engineering.

7th Sem. Must be preceded or accompanied by 755; lectures, recitations and library assignments 2; credit 2.

725. **Thesis.** Work begun.

7th Sem. Required.

729. **Seminar.** See 830.

7th Sem. Required.

738. **Reinforced Concrete Structures.** Recitations: the mechanics of reinforced concrete construction; analyzing stresses in reinforced concrete slabs, beams, floors, roofs, and arches. Designing; reinforced concrete slab and beam highway bridges; beams; columns and floor for an office building; a reinforced concrete arch, with complete tracings of most of the designs.

7th Sem. Recitation 1; lab. 2, 3 hr.; credit 3.

746. **Water Works Design.** Detailed design, preparation of plans, and estimates of cost of water works systems. Elective for students wishing additional work in sanitary engineering.

7th Sem. Prerequisite M. E. 660; must be preceded or accompanied by 755; lab. 1, 3 hrs.; credit 1.

747. **Structural Engineering.** For students taking Architectural Engineering. Determination of stresses and deflections in simple bridges, mill buildings, and office buildings; designing of bridges and steel buildings.

7th Sem. Recitations 3; lab. 2, 3 hr.; credit 5.

750. **Structural Engineering.** Continuation of 617; includes determination of stresses in viaducts, towers, railroad and highway bridges and designing and detailing of the same.

7th Sem. Recitations 2; lab. 2, 3 hr.; credit 4.

752. **Hydraulic Engineering.** Measurement of stream flow; relations of location, climate, geology and topography to rainfall, runoff and stream flow. The application of these principles to river control and improvement and to water power engineering. The theory and selection of hydraulic turbines and water power plant design. The design of river and harbor improvements.

7th Sem. Prerequisite M. E. 660; recitations 3; lab. 1, 3 hrs; credit 4.

754. **Railway Signaling.** Design and methods of operation of block and interlocking signals on single and double track roads; systems of signaling and interlocking in yards and terminals. Elective for Senior Civil Engineers wishing additional work in Railway Engineering.

7th Sem. Prerequisites 510 and 639; recitation 1; credit 1.

755. **Water Supply.** A general study of the requirements and sources of a municipal water supply. Preliminary investigations, methods of development, design and construction of waterworks systems.

7th Sem. Prerequisite M. E. 660; recitations 2; credit 2.

760. **Railway Engineering.** A continuation of 639. Maintenance way and structures; yards and terminals.

7th Sem. Prerequisite 639; recitations 2; credit 2.

761. **Railway Administration.** Organizations for small and large roads; duties of officers; freight and passenger service; theory of rates and fares; state and interstate commerce commissions.

7th Sem. Recitations 2; credit 2.

773. **Structural Engneering.** For students who elect additional work in Structural Engineering. Practical designing.

7th Sem. Prerequisite 767; lab. 1, 3 hr.; credit 1.

774. **Structural Engineering.** For students who elect additional work in Structural Engineering.

7th Sem. Recitation 1; lab. 2, 3 hr.; credit 3.

778. **Highway Engineering.** Highway laws and finance, organization of highway construction, inspection problems, reports and promotion work.

7th Sem. Prerequisite 612; recitations 2; credit 2.

779. **Road Materials Laboratory.** Practice in performing the standard tests for road and paving materials.

7th Sem. Prerequisite 612, or may be accompanied by 612; lab. 1, 3 hr.; credit 1; fee $5.00.

790. **Highway Design.** Design of rural highways and of paving, including drainage structures, curbs, sidewalks, guard fences, and miscellaneous details.

7th Sem. Prerequisite 612; recitation 1; lab. 1, 3 hr.; credit 2.

792. **Hydrology.** Measurement of stream flow; relations of geographic location, climate, geologic and topographic conditions to rainfall, runoff, and stream flow. Estimates of and fluctuations in the discharge of streams.

7th Sem. Prerequisite M. E. 660; lecture 1; credit 1.

794. **Valuation Engineering.** The theory of public utility valuations as a basis for rate making or transfer of property. A study of the current court and commission decisions and practices along this line. Given in connection with Department of Economics.

7th Sem. Prerequisite Ec. Sc. 214; recitations or lectures 2; credit 2.

822. **Advanced Reinforced Concrete Design.** For students wishing additional work in reinforced concrete construction.

8th Sem. Recitation 1; lab. 1; credit 2.

830. **Seminar.** Preceded by 343, 444, 527, 628, and 729. Meets once each week, while College is in session, and has for its members the professors and instructors in civil engineering, and all students in the Junior and Senior classes in the course in civil engineering. Programs consist of papers prepared by engineering students under the direction of the professor in charge.

8th Sem. Required.

840. **Building Sanitation.** Plumbing, systems of water supply; sewage and wastes disposal; special designs. For students in Architectural Engineering.

8th Sem. Prerequisite Arch. Engr. 436 or R. S. D. 402; recitations, lectures, 2 hrs.; credit 2.

845. **Sewerage.** Works for the sewerage and drainage of towns and cities; systems of sewerage; design of storm-water, sanitary and combined sewers; materials and methods of construction; and works for the treatment and disposal of sewage.

8th Sem. Prerequisite M. E. 660; recitations 2; lab. 1, 3 hrs.; credit 3.

848. **Structural Engineering.** For students taking Architectural Engineering. Determination of stresses in cantilever trusses, in steel arches, and in statically indeterminate frames, and designing of same.

8th Sem. Recitation 3; lab. 2, 3 hr.; credit 5.

849. **Advanced Reinforced Concrete.** For students taking Architectural Engineering. Determination of stresses in reinforced concrete buildings and the designing of the structural parts of these buildings and foundations.

8th Sem. Recitation 1; lab. 1, 3 hr.; credit 2.

862. **Railway Design.** Problems in railway location, construction, and maintenance of way.

8th Sem. Prerequisite 760; recitations 2; lab. 1, 3 hr.; credit 3.

865. **History, Composition, and Uses of Concrete.** Class and lecture work in the requisites for materials for use in concrete, theory of concrete mixtures, and factors affecting quality of concrete. Laboratory work to illustrate the principles discussed in the class room, tests of materials, making of ordinary concrete structures with especial reference to farm use, such as sidewalks, foundations, troughs, tanks, posts, etc., also ornamental concrete. For students in Agriculture and Manual Training.

8th Sem. Prerequisite M. E. 773; recitation 1; lab. 2, 3 hr.; credit 3.

869. **Structural Engineering.** Theory and design of mill building, office buildings, draw bridges, cantilever, suspension and arch bridges.

8th Sem. Recitations 2 ; lab. 2, 3 hr.; credit 4.

870. **Structural Engineering.** For students taking mine engineering. Includes the determination of stresses and practical designing of ordinary bridges and mine structures of both steel and concrete.

8th Sem. Recitations 2; lab. 1, 3 hr.; credit 3.

871. **Thesis.** Original research on chosen subjects, such as the study and design of some engineering project (including the surveys); the investigation of some engineering question, or an experimental investigation. Six hours' work or more a week, to complete thoroughly the subject chosen, and to prepare a well-digested and complete report of the results.

8th Sem. Credit 2.

877. **Design of Sanitary Works.** Detailed design, preparation of plans, and estimates of cost of sewage treatment works. Elective for students wishing additional work in sanitary engineering.

8th Sem. Prerequisite M. E. 660 and C. E. 719; must be preceded or accompanied by 755 and 845; lab. 1, 3 hrs.; credit 1.

880. **Structural Engineering.** Practical designing. For students who wish additional work in structural engineering.

8th Sem. Lab. 1, 3 hr.; credit 1.

881. **Structural Engineering.** For students who wish additional work in structural engineering.
8th Sem. Recitation 1; lab. 1, 3 hr.; credit 2.

882. **Structural Engineering.** For students who wish additional work in structural engineering.
8th Sem. Recitation 1; labs. 2, 3 hr., credit 3.

883. **Road Materials Laboratory** Practice in performing standard and special tests on bituminous road and paving materials.
8th Sem. Prerequisite 612; lab. 1, 3 hr ; credit 1; fee $5 00.

887. **Highway Engineering.** Cost keeping; auditing and accounting in highway administration. Highway contracts, highway specifications.
8th Sem. Prerequisites 612 and 790; recitation 2; credit 2.

894 **Valuation Engineering.** Same as 794.
8th Sem.

895. **Concrete and Masonry Structures.** Theory and design of concrete and masonry structures, such as dams, retaining walls, piers, foundations and abutments, special attention being given to deep and difficult foundations.
8th Sem Prerequisite C E 738; recitations 2; lab 1, 3 hr.; credit 3.

896. **City Management.** The city government and its relation to the individual, to the corporation, to the community and to the state. The fundamental ideas of management as an engineering problem, and the application of these ideas to the government of cities. Given in connection with Department of Economics.
8th Sem. Recitations 2; credit 2.

1108. **Railway Engineering.** Advanced work in railway signaling, railway design, railway economics, and railway administration and operation. PROFESSOR KING

1109. **Structural Engineering** Advanced work in the design of all types of concrete and steel structures. PROFESSOR KIRKHAM

1110. **Experimental Engineering.** Advanced work in experimental hydraulics, concrete and concrete materials, iron and steel, and other materials of construction. ASSOCIATE PROFESSOR CRUM

1111. **Water and Sewage Treatment Systems.** Preparation of plans and specifications for water and sewage treatment works, including necessary coördinate work in Chemistry and Bacteriology; special investigations in coöperation with the Departments of Chemistry and Bacteriology, and with the Iowa State Board of Health. ASSOCIATE PROFESSOR NICHOLS

1112. **Highway Engineering.** The traffic census as a factor in the design of roads; the traffic zone as a factor in the selection of routes for improvement; advanced pavement design; the relation between types of roads and methods of financing; advanced work in bituminous and non-bituminous road materials testing. ASSOCIATE PROFESSOR DODDS

# DAIRYING

PROFESSOR MORTENSEN, Dairy Building, Room 9

Professor Hammer; Associate Professor Rudnick; Assistant Professor Hauser; Instructors Brunner, Sanders, Merkeley; Fellows Cordes, Morgan; Extension Workers Odell, .....

*For information concerning the Division of Agriculture see page ...*

The Dairy Department offers a four-year course which qualifies students to become competent teachers and investigators in agricultural colleges and experiment stations; inspectors of dairy products and dairy establishments in municipal, state, and government service; or superintendents of creameries and other dairy establishments. The Dairy Department occupies the entire four-story dairy building. The milk from the college herd, together with the milk and cream shipped and hauled to the college, supplies all needs of the creamery.

## Course in Dairying

Leading to the degree of Bachelor of Science in Dairying.

Note: The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, and Horticulture are the same until the beginning of the Sophomore year.

In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1: Types and Market Classes of Beef Cattle and Sheep | 2 | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib. 1: Library Instruction (four hours for semester) | R[3] | Mil. Sci. 2: Military Art | 1 |
| *Math. 17: Algebra and Trig. | 3 | Phys. Tr. 2: Advanced Physical Training | R |
| Mil. Sci. 1: Military Art | 1 | Phys. 205: Mechanics, Heat, and Light | 2⅔ |
| Phys. Tr. 1: Physical Training | R | | |
| | 18 | | 17⅔ |

* Freshmen who show deficient preparation in mathematics may be assigned, by the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above; and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81
[3] R indicates that the study is required, without credit, for graduation.

they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies:

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| Group 1 | | Group 2 | |
|---|---|---|---|
| Dairy 12: Farm Dairying | 2⅔ | A. E. 1 or 2: Shop Work | 1 |
| Hort. 3: General Horticulture | 2⅔ | Agr. Engr. 29: The Graphic Method | ⅔ |
| | | Bot. 161: Plant Morphology | 1⅔ |
| | | Forestry 1: Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-year Course in Dairying, see page 96.

SOPHOMORE YEAR

| Third Semester | Credits[2] | Fourth Semester | Credits |
|---|---|---|---|
| Dairy 11: Cheesemaking | 3 | Dairy 13: Milk Testing and Inspection | 1⅔ |
| A. H. 3: Breed Studies of Beef Cattle and Sheep | 3⅓ | Dairy 24: Fancy Cheesemaking | 2⅓ |
| Chem. 351: Applied Organic | 3⅔ | A. H. 4: Breed Studies of Dairy Cattle, Horses, and Swine | 3⅓ |
| Engl. 18: Narration and Description | 3 | Chem. 352: Agr'l Analysis | 3⅓ |
| Hist. 24: Economic History of American Agriculture | 2 | Engl. 19: Exposition | 3 |
| Mil. Sci. 3: Military Art | 1 | Econ. Sci. 110: Agr'l Economics | 3 |
| Phys. Tr. 3: | R | Mil. Sci. 4: Military Art | 1 |
| Pub. Sp. 10: Extempore Speech | 2 | Phys. Tr. 4: | R |
| | | Choice: Pub. Sp. 11: Extempore Speech 2 / Pub. Sp. 19: Extempore Speech 1 | 1 or 2 |
| | 18 | | 18⅔ or 19⅔ |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Dairy 14: Advanced Buttermaking | 4 | Dairy 27: Butter Judging | 1 |
| Dairy 16: Technology of Milk | 1 | Dairy 101: Dairy Bacteriology | 4 |
| Dairy 26: Judging Dairy Products | 1 | Agr'l Engr. 23: Dairy Engr. | 3⅓ |
| A. H. 21: Principles of Breeding | 2 | Chem. 322: Advanced Dairy | 3⅓ |
| Bact. 1: General Bacteriology | 4 | † Choice: Engl. 412: Argumentation / Engl. 29: Literature of Farm and Community Life | 2 |
| Chem. 321: Dairy Chemistry | 3⅓ | †L. A. 41: Rural Improvement | 2 |
| †Econ. Sci. 118: Marketing of Agr'l Products | 2 | Soils 342: Soil Fertility | 3⅓ |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| *Agr'l Engr. 1 or 2: Shop Work | 1 | | |
| | 19⅓[5] | | 20 |

* Will not be required of those students who had A. E. 1 and 2 in their Freshman year.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits |
|---|---|
| Dairy 21: Ice Creams and Ices | 1⅔ |
| Dairy 30: Market Milk | 1⅔ |
| Agr'l Jour. 8: Beginning Technical Journalism | 2 |
| A. H. 20: Animal Feeding | 2 |
| Vet. Surg. 19: Obstetrics | 1 |
| Vet. Path. 744: Farm Sanitation and Communicable Diseases | 3 |
| †Mil. Sci. 11: Military Art | 1 |
| †Electives | 6⅔ |
| | 19[5] |

| Eighth Semester | Credits |
|---|---|
| Dairy 19: Seminar | 1 |
| Dairy 23: Thesis | 2 |
| Dairy 35: Management of Dairy Plants | 4⅓ |
| Agr'l Jour. 7: Agr'l Advertising | 1 |
| Agr'l Jour. 9: Tech. Jour. Practice | 2 |
| A. H. 59: Milk Production and Herd Management | 2 |
| Farm Crops 33: Forage Crop Production | 2⅔ |
| †Mil. Sci. 12: Military Art | 1 |
| †Electives* | 3 |
| | 19[5] |

* Students desiring to specialize in inspection work are advised to elect Bot. 572, Dairy 111 and 112, and Chem. 304.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Manufacturing | | 11, 14, 21, 24, 26, 27, 28, 35 | 31, 32, 33, 34 |
| General Dairying | 12, 23, 29 | 13, 16, 19, 30, 36 | 50 |
| Dairy Bacteriology | 140 | 101, 111, 112, 118 | 141 |

11. **Cheesemaking.** Cheddar cheesemaking, curing and marketing.

3rd Sem. Prerequisite 12, Chem. 104; recitation 1; labs. 3, 2 hr.; credit 3; fee $3.50.

12. **Farm Dairying.** Secretion, composition, testing, separation, and acidity of milk; preparation of starters, ripening of cream, and churning and packing butter.

1st or 2nd Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $3.00.

13. **Milk Testing and Inspection.** Advanced work in testing milk and dairy products.

4th or 6th Sem. Prerequisites 12 and Chem. 351; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.50.

14. **Advanced Buttermaking.** Manufacture and marketing of butter.

5th or 7th Sem. Prerequisite 13; recitation 2; lab. 3, 2 hr.; credit 4; fee $3.00.

16. **Technology of Milk.** Utilization of milk and its products; manufacture of condensed and powdered milk, casein and milk sugar, renovated butter, oleomargarine.

5th or 7th Sem. Prerequisites 13 and Chem. 352; recitation 1; credit 1.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

19. **Seminar.** Advanced work in dairy problems and review of Experiment Station work.

8th Sem. Prerequisites 14, 16, 21, 24, 30; recitations 1; credit 1.

21. **Ice Creams and Ices.** Care and preparation of materials used in the manufacture of ice cream and ices; manufacture of plain and fancy ice creams, ices, puddings, parfaits, and mousses.

7th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00.

23. **Thesis.** Original work on some dairy subject. May be in cooperation with the department of chemistry. Students should consult the professor concerning their subjects at the beginning of the Senior year.

8th Sem. Labs 6 hrs. per week, credit 2

24. **Fancy Cheesemaking.** Manufacture, curing, and marketing of the principal varieties of fancy cheese.

4th Sem. Prerequisites 11 and Chem. 351; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $3.00.

26. **Judging Dairy Products.** Judging of milk, cream, cheese, butter, and frozen products.

5th Sem. Prerequisite 13; recitation 1; credit 1.

27. **Butter Judging.** Judging butter from the standpoint of market requirements.

6th Sem. Prerequisites 14 and 26; lab 1, 3 hr.; credit 1; fee $3.00.

28. **Advanced Butter Judging.** Designed to qualify students to fill positions as official judges. Those electing this work will be required to attend the educational scorings in various parts of the state.

7th Sem. Prerequisite 27; lab. 1, 3 hr; credit 1.

29. **Milk Inspection.** Testing of milk and cream by the Babcock methods. Inspection of dairy products for adulteration.

8th Sem. Prerequisite Chem. 408; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.50.

30. **Market Milk.** Sanitation and pasteurization of milk.

7th Sem. Prerequisites 13 and 101; recitation 1, lab 1, 2 hr.; credit 1⅔; fee $1.50

31. **Research in Buttermaking.** Cream ripening; pasteurization; churning and storing of butter; chemical and bacteriological changes involved in these various processes.

PROFESSOR MORTENSEN, ASSOCIATE PROFESSOR RUDNICK.

32. **Research in Ice Cream Making.** Composition of ice creams, fillers, and their influences on quality and yield; homogenization, pasteurization, and storage of cream as related to ice cream manufacture.

PROFESSOR MORTENSEN.

33. **Research in Management of Dairy Plants.** Economic manufacture and marketing of dairy products. Work carried on in connection with the college and commercial plants of the state.

PROFESSOR MORTENSEN, ASSOCIATE PROFESSOR RUDNICK.

34. **Research in Market Milk.** The effect of various methods of handling on the quality of market milk and cream.

PROFESSOR HAMMER, ASSISTANT PROFESSOR HAUSER.

35. **Management of Dairy Plants.** Organization and construction of factories; creamery refrigeration, purchase of raw material and supplies, profit and loss in manufacturing, business correspondence, advertising, creamery accounting, salesmanship as related to the dairy industry.

8th Sem. Prerequisites 14, 21, 24, 30; recitations 3; labs. 2, 2 hr.; credit 4⅓.

36. **Domestic Dairying.** Nutritive and economic value of milk; its dietetics and hygiene; market milk, infants' milk, invalids' milk, cream, ice cream, condensed milk, malted milk, dried milk, fermented milks (Kephir, Koumiss), buttermilk, butter, and cheese. Demonstrations are given in types of butter and cheese, and in testing the purity of milk and butter.

6th or 8th Sem. Prerequisite Chem. 375; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.50.

50. **Conference in Dairying.** Reports and discussion on current investigations. Required of graduate students. PROFESSOR HAMMER.

101 **Dairy Bacteriology.** Same as Bact. 101. Bacteria in milk and its derivatives; the sources, modes of entry, and changes produced; the production and handling of dairy products from a hygienic viewpoint and their relation to the spread of disease.

6th or 8th Sem. Prerequisite Bact. 1; lectures 2; labs. 3, 2 hr.; credit 2 or 4; fee $5.00.

111. **Advanced Dairy Bacteriology.** Same as Bact. 111. Advanced lecture work dealing with the relation of bacteria to dairying, particular reference being given to the importance of bacteria in butter and cheese.

7th Sem. Prerequisite 101; lectures 2; credit 2.

112. **Advanced Dairy Bacteriology Laboratory.** Same as Bact. 112. Laboratory work outlined to accompany Dairy 111. Special attention is given to the isolation and identification of organisms important in dairying.

7th Sem. Prerequisite 101; labs. 3, 2 hr.; credit 2; fee $5.00.

118. **Special Dairy Bacteriology.** Same as Bact. 118. Laboratory investigation, assigned readings, and reports on bacteriological problems relating to dairying, the nature of the work being largely adapted to the individual student.

7th or 8th Sem. Prerequisite 101; credit 2 to 6; fee $5 00.

140. **Research in Dairy Bacteriology.** Same as Bact. 140. For undergraduate students.

Either Sem. Prerequisites 101, 112

141. **Research in Dairy Bacteriology.** Same as Bact. 141. For graduate students only. PROFESSOR HAMMER.

Either Sem. Prerequisite 101.

## ECONOMIC SCIENCE

### Applied Economics and Social Science

PROFESSOR BRINDLEY, Central Building, Room 223

Associate Professors Von Tungeln, Rankin; Assistant Professor Peisch

*For information concerning the Division of Industrial Science, see page 76.*

The department aims, at all times, to adapt its subjects to the needs of students in all departments of the College. This purpose is indicated by

the work offered in agricultural and engineering economics, business law, applied sociology, and research.

The provision made for offering courses in other divisions of the College to students doing major work in applied economics and social science, affords the department an excellent opportunity to train specialists in the important fields of agricultural economics, rural sociology, and business engineering; also investigators, industrial and rural experts, ministers, and teachers for positions in colleges, high schools, and secondary institutions of agriculture and the mechanic arts.

The work in Rural Economics and Rural Sociology is administered jointly by the Divisions of Industrial Science and Agriculture, and the budgets for this work are submitted by each division. The heads of these lines of work are members of the faculty of the Division of Agriculture, with their offices and work in that division, and they are also members of the faculty of the Division of Industrial Science.

The Professor in charge of Rural Sociology is also Chief of the Rural Sociology Section of the Agricultural Experiment Station. Under his direction it is possible for superintendents and teachers of Consolidated and Rural schools, ministers, and others, who already hold a recognized Bachelor's Degree, to do research work in the form of Social Surveys in their respective school districts or parishes and have the same credited as a part of the requirements for an advanced degree. This work will be known as work done *in absentia*. Blanks for collecting the data will be furnished on application by the Chief of Rural Sociology Section.

The five-year combination course leads to the degree of Bachelor of Science in the Department of Applied Economics and Social Science and also to a degree in one of the respective departments of the divisions of agriculture, engineering, and home economics. The course also presents an opportunity for training experts for rural organization service.

A plan of coöperation with standard colleges and universities greatly enlarges the sphere of usefulness of the department in training teachers, investigators, industrial and rural experts, and rural ministers.

### Course in Industrial Science—Major Economic Science

The course of study for the Freshman and Sophomore years will be found on page 246. For rules governing major work in the Junior and Senior years, and electives which may be taken in the other technical divisions of the college, see page 247. Subject to these general rules and regulations, each student, with the advice and consent of the Department, may take such major work and supporting studies as will give the most efficient training in his chosen line of applied social science.

### Major Agricultural Economics

Students desiring to take major work in Agricultural Economics will confer with the Instructor in charge of that line of work at the beginning of the Sophomore year if possible; but a complete course of study must be outlined at the beginning of the Junior year. During the Sophomore

year History 24 and at least 6 hours in Economics are required. During the Junior and Senior years 8 hours additional work in History, 10 hours in general Economics, at least 10 hours in Agricultural Economics and Rural Sociology, and 24 hours in Science and industrial departments are required. Beginning with the Junior year the student must choose a minor line of work in the Division of Agriculture or first and second minors in two divisions. Finally the student must have had at least 6 months farm experience before graduating.

### Major Rural Sociology

Students desiring to major in Rural Sociology will confer with the Instructor in charge of that line of work at the beginning of the Sophomore year, if possible; but not later than the beginning of the Junior year, a complete course must be outlined. During the Sophomore year at least 5 hours work in Economics, 6 hours supporting work in Psychology, and Rural Landscape Gardening are required. During the Junior and Senior years at least 20 hours of major work in Economics and Rural Sociology and at least 24 hours of work in Industrial Science, Agriculture, or Home Economics are required. Beginning with the Junior year the student is expected to choose a minor line of work in either the Division of Agriculture or the Division of Home Economics, except that in some cases a joint minor in the two divisions may be chosen.

### Description of Studies

| Groups | Undergraduate* | Undergraduate Graduate | Graduate |
|---|---|---|---|
| General Economics | 8[1] | 3, 4, 5, 7 | 45 |
| Rural Economics | 110, 123 | 118, 133 | |
| Engineering Economics | 209, 214 | 212, 219 | |
| Business Law, Statistics and Accounting | | 320, 325, 326, 327, 329, 332 | |
| Applied Sociology | 402 | 411, 424, 426 | |
| Research | | 513, 516, 522 | 540, 550 |

* One of the undergraduate courses is a necessary prerequisite for any of the more advanced work. Not to exceed five hours of strictly economic history may be counted as economics.

GENERAL ECONOMICS

3. **Distribution of Wealth.** Socialism, monopoly, and the government regulation of industry.

6th or 8th Sem. Recitations 2; credit 2.

4. **Money and Banking.** The principles of money, coinage, paper currency, bimetallism; gold and silver production, monetary standards and price levels. History and principles of banking, with a consideration of financial crises and banking problems, including agricultural credit.

6th or 8th Sem. Recitations 2; credit 2.

[1] The number refers to the description of the study.

5. **Public Finance.** Taxation, public debts, and public expenditures with special reference to state and local finance.

6th or 8th Sem. Recitations 3; credit 3.

7. **American Labor.** Labor as a factor in production including such closely allied problems as immigration, child labor, trade unionism, and the industrial peace movement.

6th or 8th Sem. Recitation 2; credit 2.

8. **Principles of Economics.** Continuation of 110, 123, 209, 214, 402.

4th, 6th, or 8th Sem. Recitations 3; credit 3.

45. **Advanced Economic and Social Principles.** Conference subject, primarily for graduates.

PROFESSOR BRINDLEY, ASSOCIATE PROFESSORS RANKIN and VON TUNGELN

10th Sem. Credit 2.

### RURAL ECONOMICS

110. **Agricultural Economics.** Historical and comparative agricultural systems, land tenure, size of farms, coöperation, taxation, prices, transportation, marketing, land credit, the relation of the state to agriculture.

5th, 6th, 7th, or 8th Sem. Recitations 3; credit 3.

118. **Marketing Agricultural Products.** Functions of the middleman; how far the high cost of living is due to distributive agencies; speculation; transportation; cold storage; coöperative marketing organizations for handling grain, dairy products, fruits and vegetables, live-stock; laws regulating packing, grading, moisture tests; crop statistics; public markets.

5th or 7th Sem. Recitations 2; credit 2.

123. **Forest Economics.** Relation of forests and forestry to other industries—agriculture, manufacturing, commerce; the problem of state ownership; the value of forest land; taxation of forest land; forest education.

5th or 7th Sem. Recitations 3; credit 3.

133. **Problems in Advanced Agricultural Economics.** Lectures, assigned readings, and class reports on land tenure, taxation of farm lands, farm labor, immigration, agricultural credit, and other problems whose study best meets the needs of those enrolled for the subject.

6th or 8th Sem Credit 2

### ENGINEERING ECONOMICS

209. **Engineering Economics.** Economics with special reference to the engineering profession. Mechanical engineers.

5th or 7th Sem. Recitations 3; credit 3.

212. **Public Utilities.** Telephone, telegraph, and urban utilities. Given in connection with the Engineering Division.

5th or 7th Sem. Recitations 2; credit 2.

214. **Engineering Economics.** Economics with special reference to the engineering profession. Civil and Electrical engineers.

3rd or 5th Sem. Recitations 2; credit 2.

219. **Business Economics.** The economics of business administration with primary reference to the needs of technical students.

6th or 8th Sem. Recitations 2; credit 2.

BUSINESS LAW, STATISTICS AND ACCOUNTING

320. **Rural Law.** The ordinary legal and business operations for those who expect to follow agriculture or business as a vocation. Contracts, negotiable instruments, sales, and personal property. The laws of Iowa relating to highways, fences, water rights, ditching, drainage, livestock, trespassing.

6th or 8th Sem. Recitations 1; credit 1.

325. **Veterinary Law.** Elementary principles of business law as applied to the practice of veterinary medicine.

7th Sem. Recitations 1; credit 1.

326. **Business Law.** The law of contracts, sales, bailments, guaranty, insurance, negotiable instruments, partnerships and corporations, real and personal property. Some attention given to the statutes of Iowa.

6th or 8th Sem. Recitations 2; credit 2.

327. **Elementary Accounting.** Lectures and laboratory work covering needs and problems of the subject followed by the student.

5th, 6th, 7th, or 8th Sem. Lecture and labs. 2, 2 hr.; credit 2

329. **Household Accounting.** Development of forms and practices in bookkeeping and practical accounting as applied to home administration. The principles of simple systems of accounts; practical accounting problems; division and expenditure of the family income; efficiency in household organization and distribution of labor; problems of economics and law as related to rents, leases, equities, etc.

7th Sem. Lecture 1; recitation 1; credit 2.

332. **Advanced Accounting.** For engineers: cost accounting, uniform classification of accounts, valuations, and governmental accounting. For agricultural students: corporation and coöperative association accounting. Lectures, laboratory, and problems.

6th or 8th Sem. Prerequisite 327 or knowledge of accounting; lecture 1; recitation 1, credit 2.

APPLIED SOCIOLOGY

402. **Social Economics.** The application of the principles of practical economics to the problems of the home, and to woman and child labor. The consumption phase of economics will be given special attention, including a careful study of the forces and factors involved in the high cost of living, the cost of high living, and the standard of living. For women only.

5th Sem. Recitations 2; credit 2.

411. **Principles of Applied Sociology.** The rôle of social institutions, including the family, and the activities of individuals which tend to give to industrial and social life a sound and orderly development or an unsound and disorderly development. State regulation of hours of labor;

the liquor problem; poor relief; sanitary regulation; legal status of women; etc.

8th Sem. Recitations 2; credit 2.

424. **Rural Sociology.** Rural social life and means to its improvement; social forces and factors affecting the quantity and quality of the rural population; institutions, and organizations; comparison of the country with city as regards birth-rate, death-rate, longevity, marriage, divorce, criminality, leadership, standards of morality, standards of living, thrift, public opinion, etc.

5th, 6th, 7th, or 8th Sem. Recitations 2; credit 2.

426. **Advanced Rural Sociology.** In part a continuation of 424, and in part a more specific study of the larger problems of rural life, considered from a sociological point of view.

6th or 8th Sem. Prerequisite 424, or its equivalent; recitation 2; credit 2.

RESEARCH

513. **Seminar.** A critical and analytical study and discussion of current economic and sociological problems and topics.

7th Sem. Credit 1.

516. **Seminar.** Continuation of 513.

8th Sem. Credit 1.

522. **Research.** Research in problems of Engineering and Business Economics; Agricultural Economics; Applied Sociology.

7th and 8th Sem. Credit 1 to 6.

540. **Thesis.** Thesis and research work that may be credited as partial requirements for advanced degrees. Directed by the members of the Department.

PROFESSOR BRINDLEY; ASSOCIATE PROFESSORS VON TUNGELN, RANKIN.

550. **Social Surveys in Absentia.** Social Surveys of school districts and church parishes will be credited as partial requirements for an advanced degree. ASSOCIATE PROFESSOR VON TUNGELN

## ELECTRICAL ENGINEERING

PROFESSOR FISH, Engineering Annex, Room 207

Associate Professors Bartholomew, Wright; Assistant Professors Robbins, Paine

*For information concerning the Division of Engineering, see page 50.*

The course of study in electrical engineering was established in 1891 and has been steadily strengthened from year to year, keeping pace with the developments in the theory, design, manufacture, operation, and use of electrical machinery and apparatus.

The training given and the studies required in the course are such as to fit young men with the best possible foundation for responsible positions in the profession. After completing the course and spending a reasonable time in the acquisition of practical experience, our graduates

are qualified for employment as chief operators of power plants; superintendents of construction; managers of railway, lighting, or telephone properties; designers; sales engineers; valuation engineers; consulting engineers; and for many other professional positions requiring training and responsibility.

**Equipment.** The main electrical laboratory is on the ground floor of the central portion of the Engineering Annex. It is fire-proof throughout and is provided with a system of covered trenches which carry all wires. The scheme of the laboratory has been carefully worked out with a view to obtaining the maximum amount of usefulness, with a minimum amount of waste of time on the part of the student. Few, if any, similar installations are superior in equipment and systems. For experimental purposes there are twenty-eight generators and motors of various manufacture, several transformers, over one hundred accurate instruments, besides mounted lamp banks, rheostats, choke coils, and other apparatus.

Connected with the main laboratory at one end is a workshop equipped with a motor driven engine lathe, a workbench, a grinder, and a complete set of carpenter and machinist tools for the repair and construction of apparatus. At the other end of the laboratory is the instrument room, in which are kept the portable measuring instruments and other small apparatus.

In the telephone laboratory on the second floor of the Engineering Annex is a complete assortment of the equipment necessary to familiarize the students with the construction and operation of the various telephone systems in use at the present time, and with the various methods of testing which have been developed.

The wireless telegraph station is provided with a large amount of equipment for sending and receiving, and this and other apparatus are available for purposes of instruction. Two large antennae are operated with transmitting apparatus of capacities of 2 and 2½ kilowatts. Included in the equipment of the station are detectors of all types and a large assortment of meters for tuning and testing. (For the period of the war the station is dismantled and no messages can be sent or received.)

A large room has been fitted up with telegraph apparatus for instruction in the Continental and Morse Telegraph Codes. It can accommodate sixty students at one time. In addition to the telegraph apparatus this room is thoroughly equipped with flags and other signaling apparatus.

In addition to the laboratory equipment, the department possesses a reflectoscope for the presentation of lantern slides and illustrations in the lecture room; an oscillograph for the determination of wave forms; a collection of eleven large demonstration ammeters, voltmeters, and wattmeters; and a considerable number of samples and models, and small generators, motors, and transformers, suitable for class room demonstration.

## Course in Electrical Engineering

Leading to the degree of Bachelor of Science in Electrical Engineering.

For professional degree, see page 61.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| E. E. 101[1]: Technical Lecture | R[3] | E. E. 202: Technical Lecture | R |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Engl. 116: Exposition | 4 | Engl. 117: Narration and Description | 3 |
| Math. 40: College Algebra | 3 | Math. 42b: Plane Trigonometry | 1 |
| Math. 41: Plane Trigonometry | 2 | Math. 43: Plane Analytic Geometry | 4 |
| M. E. 121: Mechanical Drawing | 2 | M. E. 219: Projective Drawing | 3 |
| M. E. 130: Forge Work | 2 | M. E. 232: Foundry Work | 2 |
| Mil. Sci. 1: Military Art | 1 | Mil Sci. 2: Military Art | 1 |
| Phys. Tr. 1: | R | Phys. Tr. 2: | R |
| | 18 | | 18 |

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| E. E. 361 :Technical Lecture | R | E. E. 462: Technical Lecture | R |
| Chem. 153: Quantitative Analysis | 2 | Math. 45: Calculus | 5 |
| Engl. 412: Argumentation | 2 | M. E. 331: Pattern Work | 2 |
| Math. 44· Calculus | 5 | M. E. 401: Mechanics of Engr. | 3 |
| M. E. 382: Drawing | 1 | M. E. 483: Drawing | 2 |
| M. E. 533: Machine Work | 2 | Mil Sci. 4: Military Art | 1 |
| Mil. Sci. 3: Military Art | 1 | Phys. Tr. 4: | R |
| Phys. Tr. 3: | R | Phys. 404: Electricity and Magnetism, Light and Sound | 5 |
| Phys. 303: Mechanics and Heat | 5 | | |
| | 19 | | 19 |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credit |
|---|---|---|---|
| E. E. 506: Principles of E. E. | 4 | E. E. 604: Direct Current Machinery | 4 |
| Math. 46: Mathematics of E. E. | 2 | E. E. 607: Alternating Currents | 4 |
| M. E. 502: Mechanics of Engr. | 5 | E. E. 619: Laboratory | 1 |
| M. E. 503: Materials of Construction | 2 | Eng. 603: Conservation of Natural Resources | 1 |
| M. E. 512: Mechanical Laboratory | 1 | M. E. 613: Mechanical Laboratory | 1 |
| Phys. 514: Physical Laboratory | 2 | M. E. 660: Hydraulics | 3 |

[1] The number refers to the description of the study
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

| | | | |
|---|---|---|---|
| †Econ. Sci. 214: Engr. Economics | 2 | Phys. 617: Physics Laboratory | 2 |
| †Mil. Sci. 9: Military Art | 1 | †Engl. 115: Engr. English | 2 |
| | | †Mil. Sci. 10: Military Art | 1 |
| | 19 | | 19 |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| E. E. 711: Alternating Current Machinery | 4 | E. E. 816: Power Transmission | 3 |
| E. E. 720: Laboratory | 3 | E. E. 821: Laboratory | 3 |
| E. E. 729: Seminar | R | E. E. 830: Seminar | R |
| Eng. 702: Specifications and Contracts | 1 | E. E. 831: Alternating Current Machinery | 2 |
| M. E. 809: Power Plant Engineering | 3 | E. E. 840: Thesis | 3 |
| M. E. 714: Steam and Gas Laboratory | 1 | Engr. 801: History of Engineering | 1 |
| †E. E. 732: Telephony | 3 | Choice: †E. E. 809: Electric Railways (3); †E. E. 833: Telephone Engineering (3); †Phys. 809: Illumination (3) | 3 |
| †Mil. Sci. 11: Military Art | 1 | Choice: †C. E. 451: Surveying (3); †E. E. 834: Radio-Telegraphy (3); †M. E. 605: Machine Design (3); †Ec. Sci. 212: Public Utilities and (2); †M. E. 815: Steam Laboratory (1) | 3 |
| †Phys. 708: Illumination | 3 | †Mil Sci. 12: Military Art | 1 |
| | 19 | | 19 |

## Five-Year Course in Electrical Engineering

(Omitted during the period of the war.)

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| General | 101,[1] 202, 361, 462, 567, 663, 664, 703, 729, 765, 766, 712, 830, 840 | 506, 607 | 1051 |
| Electrical Machinery | 610, 715 | 604, 711, 831 | |

[1] The number refers to the description of the study.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | |
|---|---|---|
| Electric Railways | | 809 |
| Electrical Power Transmission | | 816 |
| Laboratory | 717, 818 | 619, 720, 821 |
| Telephony | | 732, 833 |
| Radio-Telegraphy | 834 | |

69. **Telegraph Code and Signal Practice.** Laboratory and field practice in the use of telegraph codes and methods of signalling.

3rd, 4th, 5th, 6th, 7th, or 8th Sem.; lab. 6, 1 hr.; credit 2; fee $4.00.

70. **Radio Telegraphy.** Lectures and laboratory and field practice on the theory and use of wireless telegraph apparatus and its application to the work of the Signal Corps of the United States Army.

5th or 7th Sem., Prerequisite Phys., 404; lectures 1; lab. and field practice 1, 3 hr.; credit 2; fee $4.00.

71. **Telephony.** Lectures and laboratory and field practice on the theory and use of telephone apparatus and its application to the work of the Signal Corps of the United States Army.

6th or 8th Sem. Prerequisite Phys. 404; lectures 1; lab., and field practice 1, 3 hr.; credit 2; fee $4.00.

101. **Technical Lecture.** Elementary principles of electrical engineering. Three lectures of this course are given by the College librarian in explanation of the catalogue system and the use of the reference books.

1st Sem. Lecture 1; required.

202. **Technical Lecture.** Continuation of 101.

2nd Sem. Lecture 1; required.

361. **Technical Lecture.** Materials and equipment used in the electrical industries.

3rd Sem. Lecture 1; required.

462. **Technical Lecture.** Continuation of 361.

4th Sem. Lecture 1; required.

506. **Principles of Electrical Engineering.** The laws of magnetic and electric circuits, with especial reference to their application in electrical engineering.

5th Sem. Prerequisites, Physics 404 and Mathematics 45; recitations 4; credit 4.

567. **Small Electric Plants.** For non-electrical students only. Application of electricity to the lighting of residences and other buildings and to the driving of small machinery.

5th or 7th Sem. Recitations 2; credit 2.

604. **Direct Current Machinery.** General theory of the direct current dynamo, armature windings, characteristic curves, and the adaptation of the different types of direct-current machinery to various commercial purposes.

6th Sem. Prerequisite 506; recitations 4; credit 4.

607. **Theory of Alternating Currents.** The laws of alternating currents and the production of power in alternating current circuits.

6th Sem. Prerequisites 506 and Math. 46; recitations 4; credit 4.

610. **Direct Current Machinery.** Same topics as 604 but with less detail.

6th Sem. Prerequisite 506; recitations 3; credit 3.

619. **Laboratory.** Elementary practice with direct current circuits, machines, and instruments.

6th Sem. Prerequisites Phys. 514 or 528 accompanied or preceded by Phys. 617 or 615, and E. E. 604 or 610; lab. 1, 3 hr.; credit 1; fee $4.00.

663. **Applied Electricity.** For non-electrical students. Construction and operation of direct current machinery and auxiliary apparatus.

6th Sem. Prerequisite, Phys. 404; recitations 2; credit 2.

664. **Laboratory.** For non-electrical students. Practice with direct current machinery and auxiliary apparatus.

6th Sem. Accompanied by 663; lab. 1, 3 hr.; credit 1; fee $4.00.

703. **Electric Power.** For non-electrical students only. Elementary principles of electrical machinery and the transmission and distribution of electric power for industrial purposes.

7th Sem. Prerequisites, Phys. 303 and 404 and Math. 45; recitations 2; credit 2.

711. **Alternating Current Machinery.** Theory and operation of alternating current generators, motors, and transformers.

7th Sem. Prerequisites, 607 and 604; recitations 4; credit 4.

712. **Electrical Machinery.** Elementary principles of electrical machinery, and their application to mining.

7th Sem. Prerequisites Phys. 404 and Math. 45; recitations 3; credit 3.

715. **Alternating Current Machinery.** Same topics as 607 and 711, but with less detail.

7th Sem. Prerequisite 610; recitations 3; credit 3.

717. **Laboratory.** Practice with direct current circuits and machinery.

7th Sem. Prerequisite 604 or 610; lab. 1, 3 hr.; credit 1; fee $4.00.

720. **Laboratory.** Practice with direct current machinery and alternating current circuits and instruments. Three hours outside work a week in preparation and writing of results.

7th Sem. Prerequisites 619, 607, and 604 or 610; labs. 2, 3 hr.; credit 3; fee $8.00.

729. **Seminar.** Preparation, presentation, and discussion of papers upon special assigned topics in electrical engineering.

7th Sem. Required.

732. **Telephony.** Lectures, problems, and laboratory practice, covering the theory and use of telephone apparatus.

7th Sem. Prerequisite 607; recitations 2; lab. 1, 3 hr.; credit 3; fee $4.00.

765. **Applied Electricity.** For non-electrical students. Construction and operation of alternating current machinery and auxiliary apparatus.

7th Sem. Prerequisite, 663; recitations 2; credit 2.

766. **Laboratory.** For non-electrical students. Practice with alternating current machinery and auxiliary apparatus.

7th Sem. Accompanied by 765; lab. 1, 3 hr.; credit 1; fee $4.00.

809. **Electric Railways.** Electrical railway systems and apparatus, including the design of feeder and trolley systems and the determination of the proper equipment for a given service.

8th Sem. Prerequisite 711; recitations 3; credit 3.

816. **Power Transmission.** The principles underlying the design, construction, and operation of transmission and distributing systems.

8th Sem. Prerequisite 711; recitations 3; credit 3.

818. **Laboratory.** Practice with alternating current circuits and machinery.

8th Sem. Prerequisite 717, lab. 1, 3 hr; credit 1; fee $4 00.

821. **Laboratory.** Continuation of 720. Practice with alternating current generators, motors, and transformers. Three hours of outside work a week in preparation and writing of results

8th Sem. Lab. 2, 3 hr.; credit 3; fee $8 00.

830. **Seminar.** Continuation of 729

8th Sem. Required.

831. **Alternating Current Machinery.** Continuation of 711.

8th Sem. Prerequisite 711; recitations 2; credit 2

833. **Telephone Engineering.** Lectures, problems, and laboratory practice on telephone circuits, lines, switchboards and systems.

8th Sem. Prerequisite 732; lecture 1, lab 1, 3 hr, problem period 1, 3 hr.; credit 3; fee $4.00

834. **Radio-Telegraphy.** Lectures and laboratory practice on wireless telegraph apparatus and systems.

8th Sem. Prerequisite Phys. 404; lectures and recitations 2; lab. 1, 3 hr.; credit 3; fee $4.00

840. **Thesis.** Preparation of a thesis on some electrical engineering subject: the designing and construction of some electrical machine or measuring instrument, the efficiency test and critical study of some dynamo-electric machine or power plant, or electrical research work in special direction.

8th Sem. Credit 8.

1051 **Electrical Engineering.** Advanced work in alternating currents, electric railway engineering, electric power transmission, telephony, wireless telegraphy, and characteristics of electrical machinery. Intensive study of any one of these subjects is here made possible. Suitable major and minor work will be arranged to suit the needs of the student. Proper fees charged for laboratory work chosen.

PROFESSOR FISH; ASSOCIATE PROFESSORS BARTHOLOMEW, WRIGHT; ASSISTANT PROFESSORS ROBBINS, PAINE

## ENGINEERING

*DEAN MARSTON

DEAN BEYER, Engineering Hall, Room 315

*For information concerning the Division of Engineering, see page 50.*

The following general studies are given by the dean and vice-dean of the engineering division and by the professor of mechanical engineering, and are included in the courses of study in each of the engineering departments:

* On leave of absence for Military Service.

### Description of Studies

| Groups | Undergraduate |
|---|---|
| General | 603[1], 702, 801 |

603. **Conservation of our Natural Resources.** Ways and means of preventing unnecessary destruction of our natural resources by unwise use, and of preventing their waste through disuse. Inventory of our natural resources compiled.

6th Sem. Lecture 1; credit 1.

702. **Specifications and Contracts.** Principles of engineering contract law, business methods, specifications for engineering construction.

7th Sem. Lecture 1; credit 1.

801. **History of Engineering.** The early development of engineering, as traced from history and from the remains of ancient works; development of engineering in later periods and its growth into a separate profession; the effect on civilization, general history, and economic problems of the several inventions and other improvements which have marked the development of engineering; study of lives of the more famous engineers; development of the general technical principles of engineering.

8th Sem. Lecture 1; credit 1.

## ENGLISH

PROFESSOR NOBLE, Central Building, Room 18

Associate Professors *Raymond, Bowman; Assistant Professors Tompkins, Greenfield, Atkinson; Instructors Safford, Starbuck, Weseen, Eason, MacArthur, *Anderson, Fuller, Coolidge, *Carson, Holmes, Childs

*For information concerning the Division of Industrial Science see page 76.*

The department of English has seven classrooms and eight offices, with suitable equipment. A long section of vertical filing-cases containing the essays written in the English courses makes it possible to inspect at any time the entire composition work of each student. One room of the library contains on open shelves, accessible to the students at all times, from one to ten copies of the leading textbooks on rhetoric, composition, and letter-writing, as well as many selections from standard authors in narration, description, exposition, and argument. In literature the library includes the works of the leading authors in prose and poetry, and the standard books of literary biography, history, and criticism.

The work of this department includes composition and literature.

In composition the students are divided into four groups — agricultural, engineering, home economics, and veterinary medicine. In each group, as far as practicable, technical topics within the students' range of knowledge are used in assignments. This is done to relate their work in English to the studies in which they are being especially trained.

[1] The number refers to the description of the study.
* On leave of absence for Military Service.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Agricultural | 18[1], 19, 29 | | |
| Engineering | 115, 116, 117, 124 | | |
| Home Economics | 220, 221, 222, 230, 231, 232, 233 | | |
| Veterinary | 325 | | |
| Open to all | 401, 412, 413, 414, 417, 418, 419, 420, 421 | | |

The following studies in this department have been omitted from the Catalogue for the period of the war: 23, 24, 34, 126.

FOR AGRICULTURAL STUDENTS PRIMARILY

18. **Narration and Description.** Expository and suggestive description; better vocabulary, through search for the specific word; simple and complex narrative, with incidental description; plot and characterization; methods of securing interest as well as clearness and good order; oral composition; analysis of good models. Essay topics chosen from agricultural subjects as far as practicable.

3rd Sem. Recitations 3; credit 3.

19. **Exposition.** Types of exposition, with study of models; the logical basis in accurate and scientific definition and division; paragraphing; making plans and outlines; taking notes; abstracting; a short theme almost daily, with longer ones from time to time; analysis of good models; oral composition.

4th Sem. Prerequisite 18; recitations 3; credit 3.

29. **Literature of Farm and Community Life.** The rural environment in European and American essay, fiction, and poetry; the relation of the out-of-doors to farm life; the expression in literature of important movements of thought which will aid in interpreting life on the farm.

Either Sem. Prerequisites 18 and 19, or their equivalent; recitations 2; credit 2.

FOR ENGINEERING STUDENTS PRIMARILY

115. **Engineering English.** Technical writing for junior and senior students in engineering courses. Material of the subject worked out in active coöperation with Engineering instructors.

5th, 6th, or 7th Sem. Prerequisites 116, 117, and 412; recitations 2; credit 2.

116. **Exposition.** Similar to 19. Technical topics deal with engineering. For those who need it a review of grammar and elementary composition.

1st Sem. Recitations 4; credit 4.

117. **Narration and Description.** Similar to 18. Technical topics deal with engineering.

2nd Sem. Prerequisite 116; recitations 3; credit 3.

[1] The number refers to the description of the study.

124. **The Scientific Age in Literature.** The controversy in science, education, and religion, following the publication of Darwin's "Origin of Species;" the effect of this controversy in literature, especially in George Eliot, Arnold, Tennyson, Browning.

**5th or 7th Sem. Prerequisites 116 and 117, or their equivalent; recitations 2; credit 2.**

FOR HOME ECONOMICS STUDENTS PRIMARILY

220. **Exposition.** The logical basis in definition and division; different types of exposition, with study of models; plans and outlines; note-taking from lectures and from reading; the use of the library; the sentence and the paragraph; many short themes, with longer ones from time to time; oral composition.

**1st Sem. Recitations 3; credit 3.**

221. **Narration and Description.** Study of artistic expression in pictures, poetry, and the story; diction; letter-writing; oral composition; narrative and descriptive themes; analysis of models.

**2nd Sem. Prerequisite 220; recitations 3; credit 3.**

222. **Argumentation.** Similar to 412; term topic one that naturally appeals to women.

**7th Sem. Prerequisite 220 and 221; recitations 2; credit 2.**

230. **Literature of Modern Life.** Brief survey of English literature from Shakespeare to Wordsworth; more detailed study of some of the leading writers of the Victorian period, with special attention to Browning, Carlyle, and one of the greater novelists.

**Either Sem. Prerequisites 220 and 221, or their equivalent; recitations 2; credit 2.**

231. **Literature of Modern Life.** Introductory survey of American literature during the Colonial and Revolutionary periods; study of some of the leading writers of the nineteenth century, with special attention to the work of one poet, one essayist, and one novelist; contemporary literature of England and America, with emphasis upon its most significant tendencies.

**6th or 8th Sem. Prerequisites 220 and 221, or their equivalent; recitations 2; credit 2.**

232. **Reading for Children at Home and at School.** Lists of books accepted as juvenile classics, separated into groups for the various ages and grades, also into classes of books adjusted to different tastes and needs; the study of enough in each class to learn what constitutes a classic, and the particular value of each type; fixing standards of judgment for appraising new books as they appear; helps for parents and teachers not only in selecting the best or in choosing books to serve a given end, but also in learning how to present these books to children.

**6th or 8th Sem. Prerequisites 220 and 221; recitations 2; credit 2.**

233. **English Classics.** Classics ordinarily included in high school courses. For Home Economics students who wish to prepare themselves to teach English in addition to Home Economics.

**6th or 8th Sem. Prerequisite, 230; recitations 2; credit 2.**

FOR VETERINARY STUDENTS

325. **Veterinary English.** Technical style in description of tissues, symptoms, morbid changes, etc.; brief articles on diseases of domestic animals, prepared by the student, criticized by the instructor, and made the basis of class discussion.

2nd Sem. Recitation 1; credit 1.

OPEN TO ALL STUDENTS

401. **English Literature.** Life as interpreted by Shakespeare; the major plays — histories, comedies, and tragedies; dramatic structure, character analysis, and life problems; certain plays read rapidly, others studied carefully.

3rd or 5th Sem. Recitations, 1, 2, or 3, credit 1, 2, or 3.

412. **Argumentation.** The two methods, the inductive and the deductive, of drawing inferences and establishing truth; how to detect fallacies and how to guard against them; abstracting, collating, and classifying arguments on both sides of some live question of present importance; organizing a large mass of material and developing it into a logical brief; analysis of good models; writing forensics.

3rd, 4th, 6th, 7th, or 8th Sem. Prerequisites 116 and 117, or their equivalent; recitations 2; credit 2.

413 **Advanced Composition.** General course; brief themes on everyday topics, to give facility in writing; longer themes on topics of interest to the individual student.

7th or 8th Sem. Prerequisites 220 and 221, or their equivalent; recitations 2; credit 2.

414. **Advanced Composition.** Special course; intended to give command of one particular type of writing, as the personal essay, the short-story, etc.

7th or 8th Sem. Prerequisites same as 413; recitations 2; credit 2.

417. **English Literature.** Life as interpreted in the modern novel and short-story; plot and character analysis; setting and local color; tone and style. Purpose, not only to give familiarity with a few of the more important writers of recent times, but also to establish standards of taste that shall influence the student's choice of reading and give increased enjoyment of the best literature.

4th, 6th, or 8th Sem. Recitations 1, 2, or 3; credit 1, 2, or 3.

418. **Advanced Literature.** Life as interpreted by modern dramatists of continental Europe, beginning with Ibsen; rapid reading for thought content and broad survey, with occasional discussion of dramatic technique.

5th or 7th Sem. Prerequisites 220 and 221, or their equivalent; recitations 1 or 2; credit 1 or 2.

419 **Advanced Literature.** Continuation of 418. Life as interpreted by modern English and American dramatists, beginning with Shaw. 418 helpful but not essential.

6th or 8th Sem. Prerequisites 220 and 221, or their equivalent; recitations 1 or 2; credit 1 or 2.

420. **The Bible as Literature.** How we got the English Bible; form and structure; content, literary quality, and power. The Old Testament up to Isaiah.

3rd, 5th, or 7th Sem. Prerequisites 220 and 221 or their equivalent; recitations 2; credit 2.

421. **The Bible as Literature.** Continuation of 420. Remainder of the Old Testament; the New Testament. 420 helpful but not essential.

4th, 6th, or 8th Sem. Prerequisites 220 and 221, or their equivalent; recitations 2; credit 2.

## FARM CROPS AND SOILS

PROFESSOR STEVENSON, Agricultural Hall, Room 25

Professors Hughes, Brown; Associate Professors Smith, Hechler, Potter, McKee, Bancroft, Eastman; Assistant Professor Dorchester; Instructors Johnson, *Wilkins; Fellows Stallings, Firkins; Student Assistants Raeder, Porter, Wilson; Extension Workers Taff, Douglas, Churchill, Krall

*For information concerning the Division of Agriculture, see page 45.*

The course in Farm Crops and Soils is especially adapted for men who desire broad training in agriculture to enable them to carry out general farming operations successfully. Unless a student wishes to specialize in some particular phase of agricultural work such as trucking, fruit growing, livestock breeding, dairying, etc., he should choose the work in farm crops and soils to prepare himself in the broadest way as a practical farmer.

It is the aim of the Department, therefore, primarily to fit men to solve successfully the general crops and soils problems which are an integral part of every farmer's experience. The work is so arranged, however, that some students are fitted to fill creditably positions in agricultural colleges and experiment stations and in other institutions in which the subjects of crops and soils are taught

There is a constantly increasing demand for men well trained in crops and soils, and each year the department is asked to recommend men for such desirable positions as farm managers, extension workers for colleges and railroads, instructors in agriculture in colleges and high schools, investigators in government and state experimental work, assistants in seed houses and other similar commercial concerns, and assistants on the editorial staffs of agricultural journals.

**Farm Crops.** The course in Farm Crops comprises studies in the production, breeding, and judging of corn, small grains, and forage crops. The characteristics, soil and climatic adaptation, and production of fiber and root crops are studied. Results of the most recent experiments with different farm crops and their scientific and practical application are considered. Field study and the use in the class room and laboratory of seed grain, mounted specimens and demonstration materials give the student a thorough knowledge of crops.

* On leave of absence for Military Service.

The general work in the study of crops is conducted in the grain laboratories on the second floor of the stock and grain judging pavilions. The more advanced and more scientific study is pursued in the crops laboratories on the fourth floor of Agricultural Hall. Research laboratories with chemical and general apparatus used in farm crops research, offer special opportunities for investigation to graduate students.

**Soils.** It is the aim of the studies of the Soils course to impart a thorough knowledge of the fundamental principles which underlie all successful systems of soil management.

To this end, carefully outlined work in Soil Physics, Soil Fertility, Soil Bacteriology and Soil Management, is offered to undergraduate and graduate students.

On the first and third floors of Agricultural Hall, eight commodious and well appointed soils laboratories have been thoroughly equipped with apparatus of the latest design for accurate and scientific work. In addition to these excellent laboratory facilities, suitable greenhouse and field plots are available for study and experimentation. Photographs, charts, and maps are used in the lecture room and laboratory. Valuable and abundant data, which have been secured from extensive soil experiments, prove very helpful to students who are especially interested in the problems relating directly to the soils of Iowa.

## Course in Farm Crops and Soils

Leading to the Degree of Bachelor of Science in Farm Crops and Soils.

**Note: The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, and Horticulture are the same until the beginning of the Sophomore year.**

**In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97.**

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1: Types and Market Classes of Beef Cattle and Sheep | 2 | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain Prod. | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib. 1: Library Instruction (four hours for semester) | R[3] | Mil. Sci. 2: Military Art | 1 |
| *Math. 17: Algebra and Trig. | 3 | Phys. Tr. 2: Advanced Physical Training | R |
| Mil. Sci. 1: Military Art | 1 | Phys. 205: Mechanics, Heat, and Light | 2⅔ |
| Phys. Tr. 1: Physical Training | R | | |
| | 18 | | 17⅔ |

* Freshmen who show deficient preparation in mathematics may be assigned, by

[2] For definition of a credit see page 81.

[3] R indicates that the study is required, without credit, for graduation.

the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above; and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies:

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| Group 1 | | Group 2 | |
|---|---|---|---|
| Dairy 12: Farm Dairying | 2⅔ | A. E. 1 or 2: Shop Work | 1 |
| Hort. 8: General Horticulture | 2⅔ | Agr'l Engr. 29: The Graphic Method | ⅔ |
| | | Bot. 161: Plant Morphology | 1⅔ |
| | | Forestry 1: Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-Year Collegiate Course in Farm Crops and Soils, see page 96.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Farm Cr. 3: Corn and Small Grain Judging | 2 | Farm Cr. 33: Forage Crop Production | 2⅔ |
| *Agr'l Engr. 37: Agr'l Survey'g | 2⅔ | Soils 121: Soil Physics | 3⅓ |
| A. H. 3: Breed Studies of Beef Cattle and Sheep | 3⅓ | *Agr'l Engr. 5: Farm Machinery and Farm Motors | 2⅔ |
| Chem. 351: Applied Organic Chemistry | 3⅔ | A. H. 4: Breed Studies of Dairy Cattle, Horses, and Swine | 3⅓ |
| Engl. 18: Narration and Description | 3 | Chem. 352: Agr'l Analysis | 3⅓ |
| Geol. 16: Agr'l Geology | 2⅔ | Engl. 19: Exposition | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: | R | Phys. Tr. 4: | R |
| | 18⅓ | | 19⅓ |

* These studies may be taken in the reverse order, Agr'l Engr. 37 in the spring semester and Agr'l Engr. 5 in the fall semester.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Soils 322: Soil Fertility | 3⅓ | Farm Cr. 137: Corn Breeding | 1 |
| Farm Cr. 219, or Soils 601, Seminar[4] | R | Farm Cr. 138: Small Grain Breeding | ⅔ |
| Bact. 1: General Bacteriology | 4 | Farm Cr. 139: Forage Crop Breeding | ⅓ |
| Bot. 124: Plant Embryogeny | 1⅓ | Soils 201: Soil Bacteriology | 3⅓ |
| †Hist. 24: Econ. Hist. of Amer. Agriculture | 2 | Farm Cr. 219 or Soils 601: Seminar[4] | 1 |
| Genetics 1: General Genetics | 2⅔ | Bot. 268: Vegetable Physiology | 3⅓ |
| **Bot. 366: General Plant Pathology of Agronomic Plants | 3 | Farm Man. 2: Farm Management | 2⅔ |
| †Mil. Sci. 9: Military Art | 1 | | |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | | | |
|---|---|---|---|---|---|
| †*Elective or Agr'l Engr. 1 or 2 | (1) | 1 | †Mil. Sci. 10: Military Art | | 1 |
| | | | †Zool. 304 or 345: General or Agronomic Entomology | | 3⅓ |
| | | | †*Electives | | 1⅓ |
| | | 18⅔ | | | 18[5] |

* Students expecting to teach after graduation are urged to elect Ag. Ed. 1 and 2. Such students are also advised to consult the reference on Teachers' Certificates. See Index for page.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| *Farm Cr. 9, or 140, or Soils 103, 304, 221 or 520: Special Problems in Crop Production, Crop Breeding, Soil Physics, Soil Fertility, Soil Bacteriology, or Soil Surveying | 2 | Farm Cr. 10 or 141, or Soils 115, 316, 222 or 526: Advanced Special Problems in Crop Production, Crop Breeding, Soil Physics, Soil Fertility, Soil Bacteriology or Soil Surveying | 2 |
| Farm Cr. 220 or Soils 602: Seminar | R | Farm Cr. 220 or Soils 602: Seminar | 1 |
| Soils 406: Soil Management | 2 | Farm Cr. 234 or Soils 629: Thesis and Reports | 2 |
| Agr'l Jour. 8: Beginning Technical Journalism | 2 | A. H. 28: Animal Feeding | 3 |
| Zool. 46: General Zoology | 3⅓ | †Engl. 412 or Engl. 29: Argumentation or Literature of Farm and Community Life | 2 |
| Ec. Sci. 110: Agr'l Economics | 3 | †Mil. Sci. 12: Military Art | 1 |
| Hort. 333: Truck Farming | 2 | †**Electives | 7 |
| †Mil. Sci. 11: Military Art | 1 | | |
| †**Electives | 2⅔ | | |
| | 18[5] | | 18[5] |

* Students expecting to elect the Special Problems courses and Thesis in Soils are advised to choose one of the following groups of Electives:

| Group I — Soil Physics. | Credits | Semester |
|---|---|---|
| Chemistry 205: Applied Physical Chemistry | 3 | 5 or 7 |
| Geology 17: Petrology | 2⅔ | 5 or 7 |
| Soils 307: Advanced Soil Fertility | 1 | 6 or 8 |
| **Group II — Soil Fertility.** | | |
| Botany 560: Botany of Weeds | 1⅓ | 5 or 7 |
| Chemistry 411: Plant Chemistry | 3⅓ | 5 or 7 |
| Soils 307: Advanced Soil Fertility | 1 | 6 or 8 |

| Group III — Soil Bacteriology. | Credits | Semester |
|---|---|---|
| Bacteriology 210: Mycology and Protozoology | 2⅔ | 5 or 7 |
| Chemistry 411: Plant Chemistry | 3⅓ | 5 or 7 |
| Soils 307: Advanced Soil Fertility | 1 | 6 or 8 |
| **Group IV — Soil Surveying.** | | |
| Civil Enginering 524: Drawing | 2 | 5 or 7 |
| Geology 17: Petrology | 2⅔ | 5 or 7 |
| Geology 18: Advanced Petrology | 2⅔ | 6 or 8 |
| Soils 307: Advanced Soil Fertility | 1 | 6 or 8 |

** Students desiring to specialize in Plant Pathology are advised to elect the following subjects in the Junior and Senior years:

Bot. 367: Diseases of Special Crops (Advanced)----6
Bot. 497: General Mycology----3
Bact. 5: Advanced General Bacteriology----4
Bot. 682a: Seminar in Plant Pathology----2

[4] The standing for the year's work will be recorded at the close of the spring semester.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

## FARM CROPS GROUP

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Crop Production | | 1[1], 2, 3, 22, 33, 36, 12, 35, 21, 18, 9, 10 | 30, 37 |
| Crop Breeding | | 137, 138, 139, 140, 141 | 131, 142 |
| Thesis and Seminar | 219, 220, 234 | | |

CROP PRODUCTION

1. **Corn Production.** Structure and adaptation of the corn plant; methods of selecting, storing, testing, grading, planting, cultivating, and harvesting. Cost of production, uses of the crop, commercial marketing, insects and diseases. Field study of corn with reference to per cent stand and correlation of the parts of the stalk. Laboratory study of the structure of the stalk, ear, and kernel. Scoring and judging of single and ten-ear samples.

1st Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.00.

2. **Small Grain Production.** Oats, wheat, barley, and rye; their botanical structure, soil and climatic adaptations, seed selection, seed bed preparation and seeding, harvesting and uses; insects and diseases. Laboratory study of plants of each small grain crop; scoring, judging, and market grading of the different grains.

2nd Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.00.

3. **Corn and Small Grain Judging.** Judging samples of the different varieties of corn and small grain; market grain grading; also the origin, characteristics, and adaptations of the standard grain varieties.

3rd Sem. Prerequisites 1 and 2; lab. 1, 2 hr.; recitation and lab. 1, 2 hr.; credit 2; fee $2.00.

9. **Special Problems in Crop Production.** Investigation of farm crops. Experiments in both field and greenhouse.

7th or 8th Sem. Prerequisites 1, 2, 3, and 33; labs. 3, 2 hr.; credit 2; fee $1.00.

10. **Advanced Special Problems.** Production of farm crops.

8th Sem. Prerequisite 9; labs. 3, 2 hr.; credit 2; fee $2.00.

12. **Methods of Crop Investigation.** Experiment station methods and accomplishments. To put the student in possession of the scientific facts and principles underlying experiment station work, and to give him a working knowledge of scientific methods of such investigations.

6th or 8th Sem. Prerequisites 1, 2, 3, and 33; recitation 1; lab. 1, 2 hr.; credit 1⅔.

18. **Summer Course.** Corn, small grains, grasses, and legumes; habits of early growth, structure, rate of growth, reproduction, variation, correlations, effect of different methods of planting. Experiment Station methods.

Summer School. Prerequisites 1 and 2; labs. 3 weeks; credit 5; fee $5.00.

21. **Special Advanced Judging.** Judging corn and the various small

[1] The number refers to the description of the study.

grains, with particular reference to their variety characteristics; the marketing process, including commercial grading of the different grains.

**5th, 6th, 7th or 8th Sem. Prerequisites 1 and 2; labs. 2, 2 hr.; credit 1½; fee $2.00.**

22. **Small Grain and Forage Crops.** Production and judging of oats, wheat, barley, and rye. Characteristics, adaptation, seeding, and uses of grasses, legumes, and other forage crops. For agricultural engineers only.

**6th Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.50.**

30. **Research in Crop Production.** Problems of growth and the harvesting and storage of cereal crops. PROFESSOR HUGHES

**Either Sem. Prerequisites 1, 2, 8, 33; credit 5 or 10 hrs.**

33. **Forage Crop Production.** Grasses, legumes, and other forage plants, suitable for pasture, hay, silage, and soiling. Botanical structure, soil and climatic adaptation, cultural and harvesting methods, and uses of the different forage plants. Identification of the plants, their seed, and the common adulterants.

**4th, 6th or 8th Sem. Prerequisites 1 and 2; recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $2.00.**

35. **Experiment Station Work in Farm Crops.** Results of the most recent experiments with the different farm crops, and their scientific and practical application.

**5th or 7th Sem. Prerequisites 1, 2, 8, and 33; recitation 2; credit 2.**

36. **Fiber, Sugar, and Root Crops.** Characteristics, soil and climatic adaptation; seed bed preparation and seeding; harvesting, uses and value of cotton, flax, hemp, sugar cane, sugar beets, mangels, rutabagas, turnips, carrots, etc.

**3rd, 5th, or 7th Sem. Prerequisites 1 and 2; recitation 1; credit 1.**

37. **Conferences in Crop Production.** Reports and discussion on current investigations. PROFESSOR HUGHES

**Either Sem.**

### CROP BREEDING

131. **Research in Crop Breeding.** (a) Cereal Breeding. Special problems with the Iowa Experiment Station. (b) Forage Crop Breeding. The important crops, timothy, red clover, sweet clover, and alfalfa at the station nurseries. (c) Methods of Investigation. Special problems.

PROFESSOR HUGHES

**Either Sem. Prerequisites 137, 138, and 139; credit 5 or 10.**

137. **Corn Breeding.** A review of methods of corn improvement; ear and stalk characteristics as related to yield; ear to row plots; crossing plots; hybridization of pure lines; use of first generation hybrid seed; corn breeding for the average corn belt farmer and for the specialist.

**6th Sem. Prerequisites 8, Gen. 1, and Bot. 124; for Farm Management students, 8 and A. H. 21; recitation 1; recitation and lab. 1, 2 hr.; credit 1, for 9 weeks.**

138. **Small Grain Breeding.** A review of methods and results of early investigators; mechanics of small grain breeding as practiced by Experiment Station workers.

**6th Sem. Prerequisites 8, Gen. 1, and Bot. 124; for Farm Management students, 8 and A. H. 21; recitation 1; recitation and lab. 1, 2 hr. for 6 weeks following 137; credit ⅔.**

139. **Forage Crop Breeding.** Review of work of American and European investigators with special attention to the possibilities of improvement and methods of breeding of red clover, alfalfa, timothy; also soy beans, peas, sorghums, and other minor crops.

6th Sem. Prerequisites 3, Gen. 1, and Bot. 124; for Farm Management students, 3 and A. H. 21; recitation 1; recitation and lab. 1, 2 hr. for 8 weeks following 138; credit ⅓.

140. **Special Problems in Crop Breeding.** Experiments in both field and greenhouse.

7th or 8th Sem. Prerequisites 1, 2, 3, 33, 137, 138, and 139; labs. 3, 2 hr.; credit 2; fee $1.00.

141. **Advanced Special Problems.** Breeding of farm crops.

8th Sem. Prerequisite 140; labs. 3, 2 hr.; credit 2; fee $2.00.

142. **Conference in Crop Breeding.** Reports and discussion on current investigations. PROFESSOR HUGHES

Either Sem.

THESIS AND SEMINAR

219. **Seminar.** Juniors and Seniors hold a joint Seminar while College is in session. At each meeting papers prepared by students are presented and topics of special interest to Farm Crops students are discussed.

5th and 6th Sem. Credit 1.

220. **Seminar.** A continuation of 219.

7th and 8th Sem. Credit 1.

234. **Thesis and Reports.** This investigation must be pursued upon some subject requiring original work

7th or 8th Sem Investigations 6 hrs., credit 2.

## SOILS GROUP

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Soil Physics | | 141[1], 121, 128, 119, 103, 115 | 130, 131 |
| Soil Bacteriology | | 201, 202, 221, 222 | 231, 232, 241, 242 |
| Soil Fertility | | 342, 322, 307, 304, 316 | 332, 333 |
| Soil Management | | 406 | 438, 439 |
| Soil Surveying | | 513, 520, 526 | |
| Thesis and Seminar | 601, 602, 629 | | |

SOIL PHYSICS

103. **Special Problems in Soil Physics.** Experimentation relating to the physical characteristics of soils and their relation to crop production. A wide range of special subjects. Special advantages for a study of the physical composition of soils.

7th or 8th Sem. Prerequisites 121 or 141; investigations 6 hrs.; credit 2; fee $4.00.

[1] The number refers to the description of the study.

115. **Advanced Special Problems in Soil Physics.** A continuation of 103.

8th Sem. Prerequisite 103; investigations 6 hrs.; credit 2; fee $4.00.

119. **Forest Physiography and Soil Surveying.** Applied to forest areas; the correlation of tree growth with soil types and conditions. Physical properties of soils under forest conditions. Classification of soils in the laboratory and field. Preparation of large-scale soil maps of assigned areas.

7th Sem. Prerequisites 128 and C. E. 557; recitations 2; lab. 1, 2 hrs.; credit 2⅔; fee $2.00.

121. **Soil Physics.** Identical with 141. Intended for Farm Crops and Soils students only..

4th Sem. Prerequisites Phys. 205 and Geol. 16; recitations 2; labs. 2, 2 hrs.; credit 3⅓; fee $4.00.

128. **Physics of Forest Soils.** Similar to 141 but specially arranged to meet the needs of students in Forestry.

5th Sem. Prerequisite Phys. 321; recitations 2; labs. 2, 2 hrs.; credit 3⅓; fee $4.00.

130. **Research in Soil Physics.** Origin and classification of soils of definite areas with study of agricultural adaptation; physical characteristics of soils, with particular reference to moisture, temperature, mechanical analysis, and identification; methods of investigation, with reference to the determination of the physical properties of soils.

PROFESSOR BROWN, ASSOCIATE PROFESSORS SMITH, EASTMAN

Either Sem. Prerequisite 121 or 141; credit 5 or 10; fee $5.00.

131. **Conferences in Soil Physics.** Reports and discussion on current investigations. PROFESSOR BROWN

Either Sem.

141. **Soil Physics.** The origin, formation, and classification of soils. Moisture, temperature, and aeration in soils, together with the conditions influencing changes in these factors. The proper preparation of seed beds by ordinary farm operations in relation to the securing of optimum physical soil conditions. A general study of all the physical properties of soils.

5th Sem. Prerequisite Phys. 205 or 303; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $4.00.

### SOIL BACTERIOLOGY

201. **Soil Bacteriology.** Same as Bact. 201. Soil bacteria and their activities in their natural habitat, and a preliminary consideration of the influence which they exert on soil fertility. Purely quantitative bacteriological examinations of soils, followed by quantitative and qualitative studies of all the important bacterial processes occurring in the soil.

6th Sem. Prerequisites 322 or 342 and Bact. 1; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $5.00.

202. **Soil Bacteriology.** Same as Bact. 202. A lecture subject identical with Soils 201, except no laboratory work required. Elective for all students except those in Agronomy.

Either Sem. Prerequisites 121 or 141 and Bact. 1 or 15; recitations 2; credit 2. (May be taken at the same time as 322 or 342.)

221. **Special Problems in Soil Bacteriology.** Same as Bact. 221.

Influence of bacterial activities on soil fertility. Special problems dealing with the fixation of atmospheric nitrogen, the transformation of nitrogenous, carbonaceous, and mineral compounds in the soil; the effect of manurial and fertilizer treatment on various bacterial activities; the adequacy of present bacteriological methods.

7th or 8th Sem. Prerequisite 201; investigations 6 hrs.; credit 2; fee $5.00.

222. **Advanced Special Problems in Soil Bacteriology.** Same as Bact. 222. A continuation of 221.

8th Sem. Prerequisite 221; investigations 6 hrs.; credit 2; fee $5.00.

231. **Research in Soil Bacteriology.** Same as Bact. 231. Bacterial activities in the soil. Field, greenhouse, or laboratory experiments. The classification of soil bacteria, molds, protozoa, and higher bacteria; occurrence and action in soils. General study of the relation of soil organisms to fertility. PROFESSOR BROWN

Either Sem. Prerequisite 201; credit 5 or 10; fee $5.00.

232. **Conferences in Soil Bacteriology.** Same as Bact. 232. Reports and discussion on current investigations. PROFESSOR BROWN

Either Sem.

241. **Research in Soil Humus.** Organic material in soils looking to its classification; the rate of decomposition of organic matter in soils, correlation with the state of undecomposed matter, with micro-organisms, and with productivity. PROFESSOR BROWN, ASSOCIATE PROFESSOR POTTER

Either Sem. Prerequisites 322 or 342 and 201; credit 5 or 10; fee $5.00.

242. **Conferences in Soil Humus.** Reports and discussion on current investigations. ASSOCIATE PROFESSOR POTTER

Either Sem.

SOIL FERTILITY

304. **Special Problems in Soil Fertility.** Experimentation relating to maintaining and increasing the productive capacity of soils. A study of soil taken from the home farm, with a view toward determining the best systems of soil and crop management. Valuable for men who expect to farm under corn-belt conditions.

7th or 8th Sem. Prerequisites 322 or 342; investigations 6 hrs.; credit 2; fee $5.00.

307. **Advanced Soil Fertility.** Work of the Rothamsted experiment stations and other leading experiment stations, with special reference to the effect of different systems of soil management upon the productive capacity of the soil.

6th or 8th Sem. Prerequisite 406; recitation 1; credit 1.

316. **Advanced Special Problems in Soil Fertility.** A continuation of 304.

8th Sem. Prerequisite 304; investigations 6 hrs.; credit 2; fee $5.00.

322. **Soil Fertility.** Identical with 342. Intended for Farm Crops and Soils students only.

5th Sem. Prerequisites 121 and Chem. 352; recitations 2; labs. 2, 2 hrs.; credit 3½; fee $6.00.

332. **Research in Soil Fertility.** Special soils, with reference to the physical and chemical properties and deficiencies in plant food, with ex-

periments to test the efficiency of certain treatments; relationship between soil composition and crop production; value of fertilizing materials, as determined by pot and plot experiments.

PROFESSOR BROWN, ASSOCIATE PROFESSORS SMITH, BANCROFT

Either Sem. Prerequisite 322 or 342; credit 5 or 10; fee $5.00.

333. **Conferences in Soil Fertility.** Reports and discussion on current investigations. PROFESSOR BROWN.

Either Sem.

342. **Soil Fertility.** Maintenance of fertility; the influence of commercial fertilizers, barnyard manure, and green manures upon the quality and yield of various crops; the effect of different crops upon the fertility of the soil and upon succeeding crops; different systems of rotation, and the effect upon the productiveness of the soil of various methods of soil management. Fertility of samples of soils from the home farm or any other soil.

6th Sem. Prerequisites 141 and Chem 352; for Dairy, Chem 352 only; for Hort., Ag Ed, and Ag Engr, 141 only, recitations 2, lab 2, 2 hrs.; credit 3⅓; fee $6 00.

SOIL MANAGEMENT

406. **Soil Management.** Plant food content and productiveness of particular types or classes of soils; the utilization of soils; the principles which underlie the management of soils under arid, semi-arid, and subhumid conditions. Principles of soil conservation. Methods of experimentation employed by leading investigators and farmers in soil fertility.

7th Sem. Prerequisite 322 or 342, recitations 2; credit 2.

438. **Research in Soil Management.** The effects of certain systems of soil management; comparison of the past and present systems as shown by soil and crop conditions in different localities and under different conditions; systems of soil management under livestock, grain, mixed or truck systems of farming; management of special soils, including gumbo, peat, alkali, and others. PROFESSOR STEVENSON

Either Sem. Prerequisites 121 or 141 and 322 or 342; credit 5 or 10.

439. **Conferences in Soil Management.** Reports and discussions on current investigations. PROFESSOR STEVENSON

Either Sem.

SOIL SURVEYING

513 **Soil Surveying and Mapping.** Physical properties of soils and their physical composition as determined by mechanical analysis. The preparation of large-scale plane table maps of selected areas and a detailed survey of the soils. The principles underlying the adaptability of particular soils to different kinds of forest and fruit trees and to various farm and garden crops

7th Sem. Prerequisite 141; recitation 1, lab 1, 2 hr.; credit 1⅔; fee $2 00

520. **Special Problems in Soil Surveying.** Special problems relating to the surveying and mapping of soils. Definite soil areas will be studied with reference to the classification of the soils and the reporting of agricultural and climatological conditions.

7th or 8th Sem. Prerequisite 822 or 342, investigations 6 hrs; credit 2; fee $2.00.

526. **Advanced Special Problems in Soil Surveying.** A continuation of 520.

**8th Sem. Prerequisite 520; investigations 6 hrs.; credit 2; fee $2.00.**

THESIS AND SEMINAR

601. **Seminar.** Juniors and seniors hold a joint seminar each two weeks while college is in session. At each meeting papers prepared by students are presented, and topics of special interest to soils students are discussed.

**5th and 6th Sem. Credit 1.**

602. **Seminar.** A continuation of 601.

**7th and 8th Sem. Credit 1.**

629. **Thesis and Reports.** Must be upon some subject requiring original investigation in soils.

**7th or 8th Sem. Investigations 6 hrs.; credit 2.**

## FARM MANAGEMENT

PROFESSOR MUNGER, Agricultural Hall, Room 311
Associate Professor Lloyd; Fellow Harter; Extension Worker Thompson

*For information concerning the Division of Agriculture, see page 45.*

The Department of Farm Management offers a five-year course leading to the degree of Bachelor of Science in Farm Management. Four years are required at the College and the fifth year is spent in practical work away from the College under the supervision of the department. The four years of College work are outlined to give the student a strong general course in agriculture. The fifth year will be spent in practical work in the line which the student proposes to follow after graduation, such as, for example, practical farm management or county agent work.

There is a very large and increasing demand for farm managers, men trained in scientific and practical agriculture who are capable of managing farms on an efficient and paying basis. Students wishing to fit themselves for such work will spend one year in practical farm work upon a well managed and successful farm, during their course or following the completion of the four years' resident work. Summer vacations will also be spent by the student on farms practicing different types of agriculture. The vacation work and the one year of practical agriculture must be done under the direction of the department, and satisfactory reports will be required.

County agent work is in its beginning, and the demand for men trained along this line is practically unlimited. With the approval of the department the student desiring to take up this work will spend his fifth year with a competent and reliable county agent. Meeting the practical problems of this work and learning the methods employed by successful county agents will be of inestimable value in fitting graduates of this course for positions in this field. The course is planned and conducted with a view to fitting men especially for farm management and for farm demonstration and county agent work.

## Course in Farm Management

Leading to the degree of Bachelor of Science in Farm Management.

**Note:** The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, and Horticulture are the same until the beginning of the Sophomore year.

In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97.

### FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1: Types and Market Classes of Beef Cattle and Sheep | 2 | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib. 1: Library Instruction (four hours for semester) | R[3] | Mil. Sci. 2: Military Art | 1 |
| *Math. 17: Algebra and Trig. | 3 | Phys. Tr. 2: Advanced Physical Training | R |
| Mil. Sci. 1: Military Art | 1 | Phys. 205: Mechanics, Heat, and Light | 2⅔ |
| Phys. Tr. 1: Physical Training | R | | |
| | 18 | | 17⅔ |

*Freshmen who show deficient preparation in mathematics may be assigned, by the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above; and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies:

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| | | | |
|---|---|---|---|
| Dairy 12: Farm Dairying | 2⅔ | A. E. 1 or 2: Shop Work | 1 |
| Hort. 8: General Horticulture | 2⅔ | Agr. Engr. 29: The Graphic Method | ⅔ |
| | | Bot. 161: Plant Morphology | 1⅔ |
| | | Forestry 1: Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-Year Collegiate Course in Farm Management, see page 96.

### SOPHOMORE YEAR

| Third Semester | Credits[2] | Fourth Semester | Credits |
|---|---|---|---|
| Agr'l Engr. 37[1]: Agr'l Surveying | 2⅔ | Agr'l Engr. 5: Farm Machinery and Farm Motors | 2⅔ |
| A. H. 3: Breed Studies of Beef Cattle and Sheep | 3⅓ | A. H. 4: Breed Studies of Dairy Cattle, Horses, and Swine | 3⅓ |
| Chem. 351: Applied Organic | 3⅓ | | |

[1] The number refers to the description of the study.

[2] For definition of a credit see page 81.

| | | | |
|---|---|---|---|
| Engl. 18: Narration and Description | 3 | Chem. 352: Agr'l Analysis | 3⅓ |
| Farm Cr. 3: Corn and Small Grain Judging | 2 | Engl. 19: Exposition | 3 |
| Geol. 16: Agricultural Geology | 2⅔ | Farm Cr. 33: Forage Crop Production | 2⅔ |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: | R | Phys. Tr. 4: | R |
| | | Soils 121: Soil Physics | 3⅓ |
| | 18⅓ | | 19⅓ |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Farm Man. 1[1]: Farm Accounts | 1⅔ | Farm Man. 2: Farm Management | 2⅔ |
| Farm Man. 6: Seminar[4] | R | Farm Man. 6: Seminar[4] | 1 |
| A. H. 42: General Poultry Husbandry | 2⅔ | A. H. 28: Animal Feeding | 3 |
| Econ. Sci. 110: Agr'l Economics | 3 | A. H. 43: General Poultry Husbandry | 1 |
| Hist. 24: Economic History of American Agriculture | 2 | Bact. 15: General Bacteriology | 3⅓ |
| †Mil. Sci. 9: Military Art | 1 | Bot. 268: Vegetable Physiology | 3⅓ |
| Soils 322: Soil Fertility | 3⅓ | †Mil. Sci. 10: Military Art | 1 |
| Zool. 46: General Zoology | 3⅓ | †Electives | 3⅔ |
| †Electives | 2 | | |
| | 19[5] | | 19[5] |

Students expecting to teach after graduation are urged to elect Ag. Ed. 1 and 2 during the Junior year. This will permit the work in practice teaching during the Senior year. See further details under Teachers' Certificates.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Farm Man. 3: Advanced Farm Management | 2 | Farm Man. 5: Thesis | 3 |
| Farm Man. 4: Research | 5 | Farm Man. 8: Seminar[4] | 1 |
| Farm Man. 8: Seminar[4] | R | Agr'l Engr. 30: Farm Structures | 1⅔ |
| Choice: Agr'l Engr. 19: Rural Sanitary Equipment (1) or L. A. 41: Rural Improvement | 1 or 2 | Agr'l Jour. 13: Agr'l Publicity | 2 |
| | | Farm Cr. 137: Corn Breeding | 1 |
| | | Farm Cr. 138: Small Grain Breeding | ⅔ |
| Agr'l Jour. 8: Beginning Journalism | 2 | Farm Cr. 139: Forage Crop Breeding | ⅓ |

[1] The number refers to the description of the study.
[2] R indicates that the study is required, without credit, for graduation.
[4] The standing for the year's work will be recorded at the close of the spring semester.
[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.
† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | | | | |
|---|---|---|---|---|
| Choice | A. H. 21: Principles of Breeding (2) or Gen. 1: General Genetics (2⅔) | 2 or 2⅔ | †Mil. Sci. 12: Military Art | 1 |
| | | | Soils 202: Soil Bacteriology | 2 |
| | | | †Electives | 5⅓ |
| Choice | Hort. 333: Truck Farming (2) or Hort. 102: Commercial Orcharding (2) | 2 | | |
| †Mil. Sci. 11: Military Art | | 1 | | |
| †Electives | | 4 or 2⅓ | | |
| | | 18[5] | | 18[5] |

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Farm Management | 1[1], 5, 6 | 2, 3, 4, 8, 9 | 7 |

1. **Farm Accounts.** Farm inventories, stock and crop accounts, complete cost accounts, and farm records Special emphasis given to the interpretation of the accounts and their application to the organization and management of the farm.

4th or 5th Sem. Lecture 1; lab 1, 2 hr ; credit 1⅔; fee $1.00.

2. **Farm Management.** Farming as a business; factors controlling the success of farming as found in farm surveys; types of farming, farm layout, organization and management of successful farms.

6th or 7th Sem. Lectures and recitations 2; lab. 1, 2 hr ; credit 2⅔; fee $1.00.

3. **Advanced Farm Management.** A further study of farm organization and management Field trips for the study of successful farms. One two-day trip will be required during the semester for the study of farms in surveyed areas.

7th Sem. Prerequisites 1 and 2; lecture 1, lab. 1, 3 hr ; credit 2; fee $1.00.

4. **Research.** Investigation by the student of a special farm management problem. Students should present a satisfactory problem before registering.

7th or 8th Sem. Prerequisites 1 and 2, preceded or accompanied by 3; lab. 15 hrs.; credit 5.

5. **Thesis.** Investigation of a problem requiring original work.

7th or 8th Sem. Prerequisites 1 and 2; lab. 9 hrs ; credit 3.

6. **Seminar.** Problems, discussions, and talks relating to farm management.

5th and 6th Sem. Session, 1 every 2 wks ; credit 1

7. **Research.** Original investigation of a special farm management problem.

PROFESSOR MUNGER; ASSOCIATE PROFESSOR LLOYD

Either Sem.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

8. **Seminar.** Continuation of 6.
7th and 8th Sem. Session, 1 every 2 wks.; credit 1.

9. **Land Tenure.** Factors involved in the transition from tenant to part-owner and to owner. Methods of renting and factors determining their use. Essentials of a satisfactory lease.
7th Sem. Prerequisite 2; lecture 1; credit 1.

## FORESTRY

PROFESSOR BEACH, Agricultural Hall, Room 201
PROFESSOR MACDONALD, Agricultural Hall, Room 229
Associate Professor Morbeck; Assistant Professor Truax; Extension Worker Pearse

*For information concerning the Division of Agriculture, see page 45.*

**Courses Offered.** The Department offers a four-year undergraduate course in forestry, permitting the student to specialize either in forest management or lumber marketing. An additional year's work is provided for those who desire to take advanced work

**Opportunities for Foresters.** The rapid development of forestry in the past few years has created a large demand for trained foresters. Although forestry is a comparatively new profession in this country, positions for trained men are now open in a number of lines covering a wide field of activity. His work not only includes the management of timber lands but also the disposal of the various products which come from the forest Some of the more important lines of work in which trained foresters are engaged are the following·

*State Forestry Positions* State Foresters, nurserymen, reforestation experts, city foresters, extension men—for farm forestry, and retail lumbermen.

*National Forestry Positions* Forest supervisors, deputy forest supervisors, forest assistants, forest examiners, forest rangers, forest guards, expert lumbermen, timber sales experts, grazing experts, reforestation experts, forest nurserymen, experts in wood preservation, forest chemists, forest pathologists, experts in forest entomology, surveyors, experts on land classification, and timber scalers.

*Lumber Companies and Associations.* Managers of timber holdings, logging engineers, timber estimators, and log scalers.

*Railroad, Telephone and Telegraph Companies.* Managers of timber lands, timber estimators, experts in wood preservation, and timber inspectors.

*Timber Protective Associations* Managers and secretaries, forest rangers, and forest guards.

*Miscellaneous* Many foresters trained in the United States are engaged in forestry work in the Philippine Islands or in Canada. Both of

these domains have well established forest organizations. Positions are now open to foresters with paper manufacturing companies and other industries using forest products.

**Forestry and the War.** Thousands of foresters and lumbermen have already been called to Europe to assist in handling forestry and lumbering problems in connection with the war. Many more are going each month. This tremendous drain has greatly increased the demand for technically trained men to handle lumbering and forestry work. It is quite certain that the American forester and lumberman will play an important part in the reconstruction work which must follow the war period.

**Summer Camp.** In addition to the laboratory and field work at the college, the students are required to spend twelve weeks in summer camp in some good forest region of the country. The entire time is spent in field operations, consisting of the estimating of timber, mapping the forest types, making volume tables, and the studying of logging and milling operations. The general equipment for the camp, such as tents and field instruments, is furnished by the College; the student is required to furnish bedding and personal effects. The 1916 camp was held in lumbering regions of Colorado, Utah, California, Oregon, Washington, Idaho, Montana, and Minnesota. The 1917 camp was held in Iowa and northern Minnesota.

## Four-Year Course in Forestry

Leading to the degree of Bachelor of Science in Forestry.

Forestry students are required to complete 3 months of practical forestry work before graduation, in addition to the summer camp.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| For. 26[1]: General Forestry | 2 | For. 27: General Forestry | 2 |
| For. 38: Forestry Publications | ⅓ | Bot. 269: Plant Physiology | 3⅓ |
| Bot. 127: General Botany | 5 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Chem. 103: General Chemistry | 4 | Engl. 19: Exposition | 3 |
| Engl. 18: Narration and Description | 3 | Hist. 20: Industrial History of U. S. | 2 |
| Lib. 1: Library Instruction | R[3] | Math. 30: Plane Trigonometry | 3 |
| Math. 40: College Algebra | 3 | Mil. Sci. 2: Military Art | 1 |
| Mil. Sci. 1: Military Art | 1 | Phys. Tr. 2: Physical Training | R |
| Phys. Tr. 1: Physical Training | R | | |
| | 18⅓ | | 18⅓ |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| For. 52: Silviculture | 3 | For. 32: Forest Mensuration | 2 |
| For. 54: Lumbering | 3 | For. 53: Forest Planting | 3⅓ |
| For. 55: Forest Products | 2 | For. 59: Wood Technology | 3 |
| Bot. 26: Ecology | 1⅔ | Bot. 407: Dendrology | 4⅔ |
| Chem. 351: Applied Organic | 3⅔ | C. E. 406: Surveying | 2 |
| M. E. 121: Mechanical Drawing | 2 | Mil. Sci. 4: Military Art | 1 |
| Mil. Sci. 3: Military Art | 1 | Phys. Tr. 4: | R |
| Phys. Tr. 3: | R | Phys. 422: General Physics | 3 |
| Phys. 321: General Physics | 3 | | |
| | 19⅓ | | 19 |

SUMMER CAMP

The following courses of instruction are carried on in the summer camp for forestry students. The camp course occupies twelve weeks during the summer between the Sophomore and Junior years.

| | Credits |
|---|---|
| For. 36: Applied Lumbering | 3 |
| For. 56: Camp Technique | 1 |
| For. 57: Applied Forest Mensuration | 5 |
| For. 58: Field Silviculture | 3 |
| | 12 |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| For. 11: Forest Protection | 1 | For. 18: Forestry Seminar | R |
| For. 12: Forest Administration | 2 | For. 31: Timber Preservation | 1 |
| For. 18: Forestry Seminar | R | For. 46: Grading Lumber | 1 |
| For. 33: History of Forestry | 1 | Bot. 470: Systematic Phanerogams | 2⅔ |
| For. 61: Forest Mapping | 1 | Bot. 564: Range and Poisonous Plants | 1⅔ |
| C. E. 557: Surveying | 4 | Chem. 370: Chemistry of Forest Products | 3⅓ |
| Econ. Sci. 123: Forest Economics | 3 | C. E. 658: Surveying | 4 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| Soils 128: Physics of Forest Soils | 3⅓ | †Zool. 336: Forest Entomology | 2⅔ |
| †Zool. 304: General Entomology | 3⅓ | Elective | 1 |
| | 19⅔[5] | | 18⅓[5] |

[3] R indicates that the study is required, without credit, for graduation.
[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.
† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

### *** Forest Management Group

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| For. 9: Forest Management | 2 | For. 10: Forest Valuation | 2 |
| For. 19: Forestry Seminar | R | For. 19: Forestry Seminar | R |
| Agr'l Jour. 8: Beginning Technical Journalism | 2 | For 34: State and National Forest Law | 2 |
| Bot. 365: Forest Pathology | 3 | Bact. 19: General Bacteriology | 2⅔ |
| †Geol. 10: Agricultural Geology | 4 | C E. 659: Timber Testing | 1⅔ |
| L. A. 41: Rural Improvement | 2 | Econ. Sci. 326: Business Law | 2 |
| †Mil. Sci. 11: Military Art | 1 | L A. 36: Shade and Street Tree Management | 2⅓ |
| Pub. Sp. 10 Extempore Speech | 2 | Mil. Sci. 12: Military Art | 1 |
| Soils 119: Forest Physiography and Soil Surveying | 2⅔ | †Electives | 1 |
| | | †**Specified Electives | 4 |
| | 18⅔ | | 18⅔ |

** Choice of two subjects: Agr'l Jour 9, Tech. Jour. Practice (2 credits); Pub. Sp. 11, Extempore Speech (2); Engl 412, Argumentation (2); Engl. 29, Lit. of Farm and Community Life (2).

*** The student should choose either the Forest Management or the Lumber Marketing Group at the beginning of the Senior year

### Lumber Marketing Group

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| For. 19: Seminar | R | For 19: Forestry Seminar | R |
| For. 62· Commercial Woods | 2 | For. 45 Advanced Wood Structure | 3 |
| For 63: Lumber Markets | 3 | Agr'l Jour 7. Agricultural Advertising | 1 |
| For. 64: Lumber Transportation | 1 | C. E 659: Timber Testing | 1⅔ |
| Agr'l Jour 8: Tech. Journalism | 2 | Econ Sci. 326: Business Law | 2 |
| Econ. Sci. 327: Elementary Accounting | 2⅓ | Econ Sci. 332 Advanced Accounting | 2 |
| †Mil. Sci 11 Military Art | 1 | †Mil. Sci 12: Military Art | 1 |
| Psych. 10: Psychology of Business | 2 | †Electives | 7⅓ |
| †Pub Sp. 10: Extempore Speech | 2 | | |
| †Electives | 3 | | |
| | 18⅓ | | 18 |

## Advanced Degree in Forestry

Students finishing the four-year forestry course may continue work for an additional year and on completion of one of the following groups of studies, will receive the degree Master of Forestry.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

### Forest Management and Protection Group

| Ninth Semester | Credits | Tenth Semester | Credits |
|---|---|---|---|
| For. 40: Practice of Forestry | 2 | For. 13: Thesis | 2 |
| For. 44: Research | 4 | For. 41: Municipal Forestry | 2 |
| For. 48: Advanced Forest Protection | 3 | For. 42: Advanced Forest Management | 3 |
| Bot. 124: Plant Embryogeny | 1⅔ | For. 43: Advanced Forest Regeneration | 2 |
| Bot. 367: Diseases of Special Crops | 2 | For. 44: Research | 4 |
| Gen. 1: General Genetics | 2⅔ | Elective | 3-5* |
| Elective | 1-3* | | |
| | 16⅓-18⅓ | | 16-18 |

* Electives must be chosen in consultation with the Forestry faculty.

### Lumber Marketing and Forest Products Group

| Ninth Semester | Credits | Tenth Semester | Credits |
|---|---|---|---|
| For. 44: Research | 4 | For. 13: Thesis | 2 |
| For 47: Advanced Lumbering | 3 | For. 44: Research | 4 |
| Bot. 365: Forest Pathology | 3 | Agr'l Engr. 6: Farm Structures | 3 |
| Elective | 6* | Elective | 7-8* |
| | 16 | | 16-17 |

* Elective subjects must be chosen in consultation with the Forestry faculty.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate |
|---|---|---|
| General Forestry | 1[1], 38 | 13, 18, 19, 26, 27, 33, 40 |
| Forest Management | | 9, 10, 11, 12, 32, 34, 41, 42, 43, 44, 48, 52, 53, 61 |
| Forest Utilization | | 31, 44, 45, 46, 47, 54, 55, 59, 62, 63, 64 |
| Summer Forestry Camp | | 36, 56, 57, 58 |

The following studies in this department have been omitted from the Catalogue for the period of the war: 2, 50, 51, 60.

1. **Farm Forestry.** For agricultural students. General forestry and identification of forest trees; planting of trees as windbreaks for farmstead and crops; management and care of the farm woodlot; estimating amount and value of the products of the woodlot; identification, properties, and uses of commercial woods; seasoning and preserving posts and other timbers.

1st or 2nd Sem. Recitation 1; lect. and lab. 1, 2 hr.; credit 2.

[1] The number refers to the description of the study.

9. **Forest Management.** Management of government, state, and private forests. Regulation of the forest for a sustained yield. Forest working plans for National, private, and European forests.

7th Sem. Prerequisites 11, 32, 52; recitations 2; credit 2.

10. **Forest Valuation.** The principles underlying the determination of the value of forest lands. Compound interest formulæ used in forest calculations. The cost, sale, rental, and expectation values with reference to the forest. The assessment of damages to forest property, especially those resulting from fire.

8th Sem. Prerequisites, Econ. Sci. 123, For. 9 and 11; recitations 2; credit 2.

11. **Forest Protection.** Injury to the forest by trespass, grazing of animals, and atmospheric influences. The destruction of the forests by fires; means of prevention and suppression. Detailed fire plans for specified regions.

5th Sem. Recitation 1; credit 1.

12. **Forest Administration.** Administration of National Forests; organization of field and office forces. Construction of permanent improvements such as roads, trails, bridges, fences, cabins, fire look-out towers, telephone lines, etc. Policy in grazing work, reforestation, timber sales, claims, trespass, free use, special use, water power, etc. Forest Service accounting.

5th Sem. Recitations 2; credit 2.

13. **Thesis.** An original investigation in advanced technical work, the subject to be chosen after consultation with the Forestry faculty. Thesis may be worked in connection with other research.

10th Sem. Credit 2.

18. **Forestry Seminar.** A meeting, one period in two weeks, for the discussion of current forestry topics. Subjects are assigned for discussion in consultation with the Forestry faculty.

Required of Junior Forestry students.

19. **Forestry Seminar.** A continuation of 18.

Required of Senior Forestry students.

26. **General Forestry.** The forest resources of the United States. Relation of the forest to the industries. The principles and scope of forestry. The subject is designed to give the technical student a general survey of the field of forestry.

1st Sem. Recitation 1; recitation and lab. 1, 2 hr.; credit 2.

27. **General Forestry.** A continuation of 26.

2nd Sem. Recitation 1; recitation and lab. 1, 2 hr.; credit 2.

31. **Timber Preservation.** Importance of wood preservation, including its relation to forest conservation and management. Causes of decay. Seasoning of timbers for treatment, chemicals used, methods of application, timber-treating plants. Preservative treatment of cross-ties, structural timbers, posts, poles, mine timbers, piling, paving blocks, etc.; effect of preservation upon the strength of timber.

6th Sem. Recitation 1; credit 1.

32. **Forest Mensuration.** Construction of log rules. Scaling logs. The use of forest instruments. The construction and use of form factors and volume tables. Determining the age and volume of trees and stands. Stump and tree analysis. The methods of estimating standing timber both private and national.

**4th Sem. Recitations 2; credit 2.**

33. **History of Forestry.** The development of forestry in the different countries from the earliest periods to the present time. Special emphasis is placed on the development in Germany, France, Austria, and Switzerland where scientific forestry has reached its highest development.

**5th Sem. Recitation 1; credit 1.**

34. **State and National Forest Laws.** The laws of the different states and the national government relating to forestry and forest protection. State and national forest policy. The establishment of National Forests.

**6th Sem. Recitations 2; credit 2.**

36. **Applied Lumbering.** Logging and milling operations, including a detailed study of each operation in the production of lumber. Tools and machines used, and costs of operations. The consideration of a specified tract of timber for logging; location of camps, roads, railroads, chutes. Equipment necessary, and estimated cost of each operation.

**Summer Camp. Prerequisite 54; credit 3.**

38. **Forestry Publications.** Designed for the beginning technical forestry student. To acquaint him with the available literature on forestry, including books, periodicals, government circulars and bulletins, state bulletins, experiment station reports, lumbering journals, and other publications along technical lines relating to forestry.

**1st Sem. Six lectures during term. Credit ⅓.**

40. **Practice of Forestry.** Present forestry practice in European countries, on national forests, in state forest reserves, with lumber corporations, and on private timber holdings.

**9th Sem. Prerequisite 52; recitations 2; credit 2.**

41. **Municipal Forestry.** Its place in the conservation movement. The economic value of the forest to the community. Utilization of waste lands. Organization, personnel, and management of city forests in European countries. Revenue from city forests as a means of reducing taxes. Service as recreation grounds, game preserves, parks, and health resorts.

**10th Sem. Recitation 1; credit 1.**

42. **Advanced Forest Management.** Special problems in regulation of yield in the forest. Construction of working plans. Assessment of damages to forest property. Field investigations and reports on forest lands within Iowa. PROFESSOR MACDONALD

**10th Sem. Prerequisite 9, 10, 11, 52; credit 3.**

43. **Advanced Forest Regeneration.** In connection with 42. Nursery methods, seeding and planting. The preparation of planting plans for specific areas. Methods of increasing forest productivity in native stands

and plantations by artificial means. Field work given an important place.
PROFESSOR MACDONALD

10th Sem. Prerequisite 53; credit 2.

44. **Forestry Research.** Special investigations chosen in conference with the Forestry faculty. PROFESSOR MACDONALD

10th Sem. Credit 2 to 12.

45. **Advanced Wood Structure.** Special investigation for advanced students in the structure of wood. PROFESSOR MACDONALD

8th Sem. Prerequisite 59; credit 3

46. **Grading Lumber.** Origin and development of grading rules for lumber. Various rules employed in grading lumber in lumbering regions. The grading of by-products of lumber mills.
ASSOCIATE PROFESSOR MORBECK

10th Sem. Prerequisites 36, 54, credit 1.

47. **Advanced Lumbering.** Special investigation in logging, milling, transportation, and marketing forest products.
ASSOCIATE PROFESSOR MORBECK

10th Sem. Prerequisites 36, 54, and 55; credit 3.

48. **Advanced Forest Protection.** Injuries to forests, especially by fire. The preparation of fire plans. Timber protective associations and their work. The duty of the state toward the preservation and protection of the forests ASSOCIATE PROFESSOR MORBECK

10th Sem. Prerequisite 11, recitations 3; credit 3

52. **Silviculture.** The factors responsible for the development of various forms of forest growth. The development of forest trees, including growth, form, age, and reproduction Temporary and permanent forest types. The distribution of forest areas from a silvicultural standpoint. The treatment of woodlands; care at different stages of growth. Silvicultural systems of management with their application. Improvement cuttings.

3rd Sem. Recitations 3; credit 3.

53. **Forest Planting.** Methods of collecting and storing tree seeds. Regions of collecting. Testing vitality of seeds. Direct seeding. Nursery practice, including seed bed methods, transplanting and care of young trees. Field planting Consists of lectures, readings, laboratory, and field work.

4th and 6th Sem. Prerequisite 52; recitations 2; field and lab. 4 hrs.; credit 3⅓

54. **Lumbering.** Standing timber in the United States, location, amount, species, value; the development of the industry. Logging and milling. The grading, selling, shipping, and marketing of lumber. Timber bonds. Operations in the various forest regions of the United States, giving especial emphasis to a comparison of the costs of logging and manufacture.

3rd Sem. Recitations 3; credit 3.

55. **Forest Products.** The manufacture of pulp and paper, shingles, lath, cooperage stock, veneer, excelsior, boxes, railroad ties, posts, and

poles. The distillation of wood for the production of wood alcohol, charcoal, turpentine, resin. The production of tannin and essential oils.

3rd and 5th Sem. Recitations 2; credit 2.

56. **Camp Technique.** Personal equipment for camp life; camp and cooking equipment. Camp food. Ration lists for trips of different kinds. Useful knots. Practice in throwing various packing hitches. Emergency equipment in case of sickness or accident. First aid practice.

Summer Camp. Field and demonstration work; credit 1.

57. **Applied Forest Mensuration.** The scaling of logs, the determining of the volume of other forest products, and the reconnaissance of timbered areas. Complete reconnaissance of a specified area, including the running of primary and secondary base lines, the estimating and mapping of the timber by types, the making of contour maps, the writing of forest descriptions by watersheds, etc.

Summer Camp. Prerequisite 32; credit 5.

58. **Field Silviculture.** A continuation of 52. Forest types; factors determining each. Type mapping. Natural reproduction of the forest under varying conditions. Improvement cuttings. Marking timber for cutting with reference to the silvicultural systems.

Summer Camp. Prerequisite 52; credit 3.

59. **Wood Technology.** The structural and physical properties of economic woods in the United States and their identification. Detailed structure studied under compound microscope. Identification by physical and structural characteristics with the naked eye and by means of hand lens. Qualities, such as grain, texture, weight, color, hygroscopiscity, etc., as related to specific uses. Seasoning, warping, checking, shrinking, and imperfections in wood, with their causes and effects.

4th, 6th, and 8th Sem Recitation 1, labs 2, 3 hr.; credit 3; fee $2 00.

61. **Forest Mapping.** A laboratory subject covering the field of forest mapping. Especial stress laid on topographic mapping and the symbols used in National Forest work; type maps, stand maps, reproduction and other maps will be made from field data collected during the preceding summer camp.

5th Sem. Laboratory, field, and office, 3 hrs.; credit 1.

62. **Commercial Woods.** An exhaustive study of the more important native and exotic species found on the markets and consumed in the wood using industries; the range, occurrence, stand, methods of logging and milling, drying, finishing, and value of the more important species. The physical and mechanical properties, the structure, and the adaptability and use of the more important woods for the various commercial purposes.

7th Sem. Lectures and recitations 2; credit 2.

63. **Lumber Markets.** Wholesaling and retailing of lumber. The wholesale markets; retail markets; exports and imports of lumber and other forest products; supply and demand; lumber prices; lumbermen's associations and other related work. Lectures and assigned readings.

7th Sem. Prerequisite, For. 54; recitations 3; credit 3.

64. **Lumber Transportation.** Lectures on lumber transportation; factors influencing methods of lumber transportation; freight rates and related matters.

7th Sem. Lecture 1; credit 1.

Botany 365. **General Forest Pathology.** Principles and practice in plant pathology as they are related to forest trees and their products.

7th Sem. Prerequisites 127 or 128 or 161, 268, 407; recitation 1; labs. 2, 3 hr.; credit 3; fee $3.00.

Botany 407. **Dendrology.** Families, genera, and species of the North American trees, beginning with the gymnosperms and ending with the angiosperms. A collection of thirty conifers and seventy deciduous trees will be required.

4th or 8th Sem. Prerequisite Bot. 161 or 127; recitations 2; labs. 2, 3 hr. in lab. and 1, 2 hr. in field; credit 4⅔; fee $4.00.

Chemistry 370. **Chemistry of Forest Products.** A brief outline of the chemistry of plant growth followed by a study of the preparation and utilization of the chemical products obtained from the forest.

6th Sem. Prerequisite 351; lectures 2; labs. 2, 2 hr.; credit 3⅓; deposit $10.00.

Civil Engineering 406. **Surveying.** Pacing, ranging, chaining, uses of the forest service compass and other simple instruments. A good general foundation for the work of the following summer in camp.

4th Sem. Prerequisite, Math. 30; must be followed by C. E. 557 and 658; labs. 2, 3 hr.; credit 2; fee $2.00.

Civil Engineering 557. **Surveying.** The uses of the compass, level, transit, and plane table; angle measurement; traversing; leveling; U. S. land subdivision; retracement surveys; observations for meridian; taking topography; calculations and office work.

5th Sem. Prerequisite 406; must be followed by C. E. 658; recitations 2; labs. 2, 3 hr.; credit 4; fee $3.00.

Civil Engineering 658. **Surveying.** A continuation of C. E. 557.

6th Sem. Prerequistie 557; recitations 2; labs. 2, 3 hr.; credit 4; fee $3.00.

Civil Engineering 659. **Timber Testing.** Tests for the properties of timber as a structural material, and comparative tests of the different species. The methods used by the United States Forestry Products Laboratories will be used.

6th or 8th Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $4.00.

Economic Science 123. **Forest Economics.** Relation of forests and forestry to other industries—agriculture, manufacturing, commerce; the problem of state ownership; the value of forest land; taxation of forest land; forest education.

5th or 7th Sem. Recitations 3; credit 3.

Zoology 336. **Forest Entomology.** Life histories and habits of the more important insects injurious to American forests and forest products. So far as possible the insects and their work will be studied in the field as well as in the laboratory.

6th or 8th Sem. Prerequisite Zool. 304; recitations 2; labs. 1, 2 hr.; credit 2⅔; deposit $3.00.

## GENETICS

A line of work under the joint administration of the heads of the Departments of Animal Husbandry for animal genetics and of Horticulture and Farm Crops and Soils for plant genetics.

PROFESSOR BEACH, Agricultural Hall, Room 201
PROFESSOR STEVENSON, Agricultural Hall, Room 25
PROFESSOR PEW, Agricultural Hall, Room 103
ASSOCIATE PROFESSOR LLOYD-JONES, Agricultural Hall, Room 103
Instructor Stonecifer

1. **General Genetics.** Heredity and variation with special reference to the improvement of animals and plants. Lectures and recitations, with demonstrations and assigned reading.

Either Sem. Prerequisite, or required with this course, Zool. 231 or Bot. 124, or equivalents; lectures 2; lab. 1, 2 hr.; credits 2⅔.

2. **General Genetics.** Similar to 1 but without laboratory work.

Either Sem. Prerequisites same as 1; lecture 2; credit 2.

10. **Advanced Genetics.** A scientific study of the experimental breeding of animals and plants and the newer theories of heredity.

7th Sem. Lectures 2; lab. 1, 2 hr.; credit 2⅔.

11. **Advanced Genetics.** Similar to Genetics 10, but without laboratory work.

Credit 2.

20. **Problems of Heredity and Breeding.** Seminar. Weekly conferences in which current work in the experimental study of heredity and special topics are discussed. ASSOCIATE PROFESSOR LLOYD-JONES

Credit 1, per sem.

### Applied Genetics

In addition to the above, studies in applied genetics are offered by the various departments as follows:

| | Credits |
|---|---|
| Animal Husbandry 8: Animal Breeding | 2 |
| Animal Husbandry 21: Animal Breeding | 2 |
| Animal Husbandry 65: Research in Animal Breeding | 3-10 hrs. |
| Farm Crops 137: Corn Breeding | 1 |
| Farm Crops 138: Small Grain Breeding | 1 |
| Farm Crops 140: Special Problems in Crop Breeding | 2 |
| Farm Crops 141: Advanced Special Problems | 2 |
| Farm Crops 131: Research in Crop Breeding | 5-10 hrs. |
| Horticulture 7: Plant Breeding | 2 |
| Horticulture 58: Thesis or Research | 3-15 hrs. |

## GEOLOGY

PROFESSOR BEYER, Engineering Hall, Room 304
Assistant Professors Galpin, Smith

*For information concerning the Division of Engineering, see page 50.*

The work of this department is conducted by means of recitations, lectures, conferences, laboratory work, and field excursions. The student is thus afforded an opportunity to gain a familiarity with the principles and theories discussed in the leading text-books, and encouraged to test these theories and verify the principles.

Geological studies are designed to meet the requirements of students in civil engineering, students in the division of agriculture, students specializing in zoology and botany, students in mining engineering, those who expect to become mining geologists, and students taking Industrial Science courses.

Nearly every state and territory maintains a geological survey or mining bureau or both. The federal government maintains the Geological Survey and the Bureau of Mines. Mining and exploration companies and many of the leading railways include one or more geologists in their corps of expert advisers. Many high schools and most colleges and universities include geology in their curricula. The supply of well trained geologists never exceeds the demand.

### Course in Industrial Science—Major Geology

For Freshman year see page . , except that students shall complete eight credits in Chemistry.

SOPHOMORE YEAR

| Third Semester | Credits[2] | Fourth Semester | Credits |
|---|---|---|---|
| Geol. 6: Physiography | 3 | Geol 1: General Geology | 3 |
| Chem. 157: Quantitative Analysis | 4 | M. E. 220: Projective Drawing | 2 |
| M. E. 121: Mechanical Drawing | 2 | Mil. Sci. 4: Military Art | 1 |
| Mil. Sci. 3· Military Art | 1 | Mod Lang.: German | 3 |
| Mod. Lang.· German | 3 | Phys. Tr 4· Phys. Training | R |
| Phys Tr. 3: Phys. Training | R | Phys. 404: Electricity, Magnetism, Light and Sound | 5 |
| Phys 303: Mechanics and Heat | 5 | Zool. 52: General | 5 |
| | 18 | | 19 |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Geol 2 General Geology | 3 | Geol 4. Advanced Geology | 4 |
| Geol. 7: Mineralogy | 4 | Choice: Mn. E. 614· Metallurgy (3) | 3 |
| C. E. 102: Field Work | 2 | Choice: Geol. 21: Optical and Physical Mineralogy (3) | 3 |
| M. E. 322. Mechanical Drawing | 2 | | |

[1] The number refers to the description of the study
[2] For definition of a credit see page 81

| | | | |
|---|---|---|---|
| Mn. E., 530: Assaying | 3 | C. E. 203: Surveying | 3 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| Electives | 2 | Electives | 6 |
| | 16[5] | | 16[5] |

NOTE: Geol. 24: Six weeks' Summer Field Work in Geol. is required before graduation. Students are advised to take this work during the vacation between the Junior and Senior years.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Geol. 5: Economic Geology | 4 | Choice: Geol. 8: Thesis (5) / Geol. 15: Special Paleontology (5) | 5 |
| Geol. 12: Invertebrate Paleontology | 4 | Geol. 14: Vertebrate Paleontology | 4 |
| Choice: Geol. 22: Petrography (4) / Mn. E. 715: Metallurgy (4) | 4 | Geol. 23· Petrography | 4 |
| †Mil. Sci. 11: Military Art | 1 | †Mil Sci. 12: Military Art | 1 |
| Engl. 115: Engineering English | 2 | Electives | 4 |
| Electives | 3 | | |
| | 18[5] | | 18[5] |

## Description of Studies

| Groups | Undergraduate | Undergraduate Graduate | Graduate |
|---|---|---|---|
| General Geology | 1[1], 2, 3, 16 | 4, 5, 6, 7, 8, 10, 12, 17, 21, 23, 24 | 25, 26 |

1. **General Geology.** Dynamic and structural. Principles which form the groundwork of the science. Recitations, lectures, laboratory, and field work.

4th and 5th Sem. Prerequisites, one or more semesters each of Chemistry and Physics; recitations 2; lab. 1, 3 hr.; credit 3; fee $1.00.

2. **General Geology.** Continued. Historical and stratigraphic.

5th or 7th Sem. Prerequisite 1; recitations 3; lab. 1, 3 hr.; credit 3; fee $1.00.

3. **Engineering Geology.** Fundamental principles of dynamic and structural geology; common minerals and rocks, especially those important in structural materials.

5th Sem. Prerequisites, Chemistry, Physics; recitations 2; lab. 1, 3 hr.; credit 3; fee $1.00.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

[1] The number refers to the description of the study.

[3] R indicates that the study is required, without credit, for graduation.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Industrial Science. See Business Engineering, page 131.

4. **Advanced Geology.** Petrologic and advanced structural. Rocks, their origin, occurrence, and association.

6th and 7th Sem. Prerequisite 1 or 3; recitations 3; lab. 1, 3 hr.; credit 4; fee $1.00.

5. **Economic Geology.** Non metallics, and the metallics. Mode of occurrence, association, and origin of the leading economic products.

7th or 8th Sem. Prerequisites 1 or 3, and 4; recitations 3; lab. 1, 3 hr.; credit 4.

6. **Physiography.** Evolution of the physical features of the earth, and the leading agencies which influence their development.

3rd or 4th Sem. Prerequisites, Chemistry and Physics; recitations 3; credit 3.

7. **Mineralogy.** Morphological and physical characters of crystalline substances; descriptive and determinative mineralogy.

5th Sem. Prerequisites, Mathematics, Chemistry, Physics; recitations and laboratories 4, 2 hr.; credit 4; fee $2.00.

8. **Thesis.** Students in mining engineering or industrial science electing to write a thesis in geology are required to take five hours special work. This special work may be in economic geology, petrology, dynamic geology, structural geology, metamorphism, historical geology, or stratigraphic geology.

8th Sem. Credit 5.

10. **Agricultural Geology.** Principles of dynamic and structural geology, with especial reference to the origin of soils and the surface features.

7th Sem. Recitations 3; lab. 1, 3 hr.; credit 4; fee $1.00.

16. **Agricultural Geology.** Principles of dynamic and structural geology, with especial reference to soil origin and distribution.

3rd Sem. Recitations 2; field and laboratory 1; credit 2⅔; fee $1.00.

17. **Petrology.** The more important rock-making minerals and leading rock types, with especial reference to soils.

5th or 7th Sem. Prerequisite 16 or equivalent; recitations 2; lab. 1; credit 2⅔; fee $1.00.

21. **Optical and Physical Mineralogy.** Minerals are studied by means of the polarizing microscope. Principal rock-forming minerals are considered and their physical properties are reviewed.

6th Sem. Prerequisite 7; recitation 1; labs. 2, 3 hr.; credit 3; fee $2.00.

24. **Summer Field Work.** Required of all students who major in geology. Topographic and geologic mapping and economic work.

Six weeks' credit.

25. **Advanced Soils Geology.**

Work continued through 1 to 4 semesters. Credit 2 to 5 per semester as arranged. Fee $1 to $3 per semester.

26. **Advanced Mining Geology.**

Work continued through 1 to 4 semesters. Credit 2 to 5 per semester as arranged.

# HISTORY

PROFESSOR CESSNA, Central Building, Room 212
Associate Professor Schmidt; Instructor *Arragon

*For information concerning the Division of Industrial Science see page 76.*

The work in history is intended to provide well arranged courses of instruction for technical students in all divisions of the College. The chief purpose of these courses is to train students in the use of the historical and comparative method, and to enable them to think intelligently on present day problems of human betterment and to become useful American citizens. In harmony with this purpose a number of specialized subjects in economic and political history are offered.

Subjects listed "Undergraduate and Graduate" are not open to Freshmen. Senior college students may be admitted to studies listed "Graduate" upon recommendation of the instructor in charge of the subject.

The college and history seminar libraries are equipped with the best and most recent works bearing on these subjects. This institution is a depository for all the leading government publications, many of which are of considerable value as reference works in economic and political history.

## Description of Studies

| Groups | Undergraduate | Undergraduate Graduate | Graduate |
|---|---|---|---|
| European History | 4 | 6, 10 | |
| American History | 20, 24 | 34, 36, 39, 45, 48 | 50 |
| Research | | | 76, 98 |

The following studies in this department have been omitted from the catalog for the period of the war: 9, 36.

### EUROPEAN HISTORY

4. **Political and Social History of Modern Europe.** Industrial revolution; era of Metternich; democratic reform and revolution; the growth of nationalism and social factors in recent European history. The United Kingdom of Great Britain and Ireland; Latin Europe; Teutonic Europe; the new imperialism; the British Empire and the spread of European civilization in America, Asia, and Africa. Special attention will be given to the origins of the European war, the entrance of the United States into the struggle, and the probable effects of the war on democracy and nationalism.

2nd Sem. Recitations 2; credit 2.

6. **Economic History of Modern Europe.** A rapid review of the transition from medieval to modern economy, in the sixteenth, seventeenth, and eighteenth centuries, followed by a more detailed study of the economic development of Europe since 1815. Special attention given to the industrial revolution in England; the effect of the Napoleonic wars upon

* On leave of absence for military service.

European agriculture and manufactures; spread of the factory system into Belgium, France, and Germany; the development of railways and canals; the expansion of over seas trade; the rise of socialism and labor organizations; the European tariff; the growth of industrial concentration; economic causes and problems of the European war; and the probable effect of the war on agriculture, industry, and commerce. (Alternate with 10.)

6th or 8th Sem. Recitations 2; credit2.

10. **Economic History of England.** Development of English agriculture, industry and commerce from the Anglo-Saxon conquest to the present time. Early agriculture; early town life; merchant and craft guilds; markets and fairs; rise of commerce, trade routes; the industrial revolution; the great improvements in agricultural and manufacturing industries during the nineteenth century; the origin and growth of trade unions, co-operation in distribution, production, farming and credit Alternate with 6. (Not given in 1918-1919)

6th or 8th Sem. Recitations 2; credit 2

AMERICAN HISTORY

20. **Industrial History of the United States.** Colonial industry; economic aspects of the revolution; development of manufacturing, internal trade, and transportation; foreign commerce; the tariff; banking and currency; railroad development; the growth of great corporations; the organization of labor; and the economic questions raised by the European war.

3rd, 4th, 5th, or 6th Sem. Recitations 2; credit 2

24. **Economic History of American Agriculture.** A preliminary survey of the economic history of American agriculture as a field for investigation, followed by a study of colonial agriculture; the westward movement of pioneer and planter into the Mississippi Valley; the agrarian revolution and the opening of the far West; and the reorganization of the agricultural industry. Special attention given to the origin, growth, control, and disposition of the public domain; the settlement of the West; the various influences affecting the growth of the agricultural industry and of agricultural society in the different sections; relation of agriculture to other industries, to politics, and to legislation; and an historical and comparative analysis of some of the present day problems confronting the farming class: tenancy, transportation, and rural organization.

5th, 6th, 7th, or 8th Sem. Recitations 2; credit 2

34. **American Government and Politics.** Introductory survey of the historical foundations of American government; general features of the federal system; nomination, election, and powers of the president; powers of congress; the supreme court; foreign affairs; national defense; government of territories; the state executive department, the legislature, and the judicial system; municipal government, including a study of the mayor and council system, the commission system, and the commission-manager plan; local rural government; social and economic legislation.

5th or 7th Sem. Recitations 3, credit 3.

36. **Financial and Tariff History of the United States.** Foundations

of our financial system; first and second United States banks; crisis of 1837; independent treasury system; state banking before the Civil War; financial measures of the war period; green banks and resumption; funding and payment of the public debt; free silver and the Bland Act; McKinley and Sherman Acts; crisis of 1893; and financial legislation since 1900. Attention also given to the tariff question in its relation to financial and other problems.

5th or 7th Sem. Recitations 2; credit 2.

39. **History of Labor Problems in the United States.** Early American labor conditions; economic forces leading to the growth of slavery and to its abandonment; the growth of labor organizations; and the effect of periods of depression and prosperity. Attention given to the problems of immigration, labor of women and children, settlement of industrial disputes, and the movement of real wages.

5th or 7th Sem. Recitations 2; credit 2.

45. **History of Foreign Relations of the United States.** Foundations of American foreign and military policy; the Monroe Doctrine and the doctrine of permanent national self interest; the diplomacy of territorial and commercial expansion; new position of the United States as a world power at the close of the Spanish-American war; causes, problems, and objects of the present world war; and the probable effects of the war on the foreign, military, and naval policies of the United States.

6th or 8th Sem. Recitations 3; credit 3

48. **The World War, 1914-1918.** A rapid review of international relations from the establishment of the German Empire to the outbreak of the war, followed by a study of the struggle in its military, economic, political, and diplomatic aspects, with a consideration of the probable effects of the war on internal and foreign policies.

5th or 7th Sem. Recitations 2; credit 2.

50. **The History of the West.** The public lands; settlement of the west; the agrarian revolution; internal trade and the development of the great primary grain and livestock markets; the range and ranch cattle industry; irrigation and dry farming; and the westward advance of the mining frontier. Relation of the west to problems of transportation, currency, banking, tariff, and foreign affairs. Special attention will be given to the relation of the west to the Civil War in its economic and political aspects. ASSOCIATE PROFESSOR SCHMIDT

7th Sem. Recitations 3; credit 3.

RESEARCH

76. **Economic History of Agriculture in Iowa.** Selected phases of the economic history of agriculture in Iowa will be studied. The nature of the topics selected by members of the class will depend upon previous training and individual preferences. ASSOCIATE PROFESSOR SCHMIDT

9th Sem Conferences, reports, and term papers. Credit 2.

98. **Research in Economic History.** ASSOCIATE PROFESSOR SCHMIDT

9th or 10th Sem. Credit 2 to 6 hours.

## HOME ECONOMICS

PROFESSOR MACKAY, Home Economics Building, Room 105

Professor E. Miller; Associate Professors Gettemy, Brandt, Monsch, Tilden; Assistant Professors Humphrey, Olsen, Witwer, McNeal; Instructors *Booth, *Goodrich, Kedzie, Ingersoll, Cation, C. Miller, English, Henderson, Baker, Palmer, Dodson, Van Steenberg, Smith; Extension Workers Knowles, Bentley, L. H. Campbell, Jessie Campbell, Barnett, Katherine Miller, Richardson, Sutter, Conlon, Brekke, Hopkins, Jordan, Richards, Wood, Knapp, Gregg, Gibbons

*For general information concerning the Division, see page 71.*

Studies in other divisions of the College in Agriculture, Engineering, and Science are open to Home Economics students as electives. Students are able to complete all the work offered in Household Science and Household Art by a careful selection of electives. Those desirous of taking more than the required work in the Industrial Science Division may do so by choosing electives in the departments of Modern Language, English, Economic Science, Mathematics, Bacteriology, Botany, History, Chemistry, Zoology, Psychology, and Public Speaking. Those who desire work in the Agricultural Division may elect studies in Education, Horticulture, Landscape Gardening, Dairy, Poultry Husbandry, Photography, and other agricultural subjects. Manual Training and Architectural Engineering may be elected in the Engineering Division. By taking the five-year course in Industrial Science and Home Economics the student may secure the two degrees of Bachelor of Science and Bachelor of Science in Home Economics.

NOTE: Beginning courses in Home Economics are offered in both semesters so that students may enter at the beginning of either semester.

NOTE: The attention of students is called to the fact that a complete list of electives for Home Economics students is on file in the office of the Division and will be supplied upon request.

### Courses in Home Economics

Leading to the degree of Bachelor of Science in Home Economics.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| *H. Ec. 1[1] or 5: Elementary Textiles and Clothing or Intermediate Textiles and Clothing | 2⅓ | H. Ec. 4: Textiles and Clothing or Elective | 2⅓ |
| H. Ec. 41: Personal Hygiene | 1 | H. Ec. 50: Applied Design | 2⅓ |
| Bot. 161: Plant Morphology | 1⅔ | Bot. 588: Economic Botany | 1⅔ |
| | | Chem. 110: General Chemistry and Qualitative Analysis | 3⅓ |

* H. Ec. 5 offered fall semester only.

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
* Absent on leave.

| | | | |
|---|---|---|---|
| Chem. 103: General Chemistry | 4 | Engl. 221: Narration and Description | 3 |
| Engl. 220: Exposition | 3 | Hist. 4: Political and Social History of Modern Europe | 2 |
| Lib. 2: Four Lectures | R[3] | Choice: Mod. Lang.: French, German, or Spanish (3) / Math. 30: Plane Trigonometry (3) | 3 |
| Choice: **Mod. Lang.: French, German, or Spanish (5) / Math. 4: College Algebra (5) | 5 | Phys. Cul. 2 or 12: Light Apparatus | R |
| Phys. Cul. 1 or 12: Elementary Gymnastics | R | | |
| | 17 | | 17⅔ |

NOTE: Students who desire the First Grade State Certificate refer to Teachers' Certificates.

** Where French, German or Spanish is selected the first semester the same study must be continued during the second semester.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| H. Ec. 43: Foods — Selection and Preparation or *H. Ec. 73: Foods (1⅔) and Electives (⅔) | 2⅓ | H. Ec. 44: Foods — Selection and Preparation or H. Ec. 74: Foods (1⅔ and Electives (⅔) | 2⅓ |
| H. Ec. 51: Applied Design | 2⅓ | Bot. 287: Plant Physiology | 1⅔ |
| Chem. 375: Applied Organic Chemistry | 4⅓ | Chem. 376: Food Chemistry | 3⅓ |
| Phys. Cul. 3, 5, 7, or 12: Advanced Gymnastics | R | Chem. 386: Elem. Tex. Chem. | 1 |
| Phys. 330: General Physics | 5 | Engl. 230: Literature of Modern Life | 2 |
| Psych. 7: Outlines of Psychology | 3 | Phys. Cul. 4, 6, 8, or 12: Additional Gymnastics | R |
| | | Zool. 51: General Zoology | 3⅓ |
| | | Electives | 3⅓ |
| | 17 | | 17 |

NOTE: Those who wish to specialize in Household Science refer to Household Science Group; for Household Art refer to Household Art Group.

* H. Ec. 73 offered fall semester only.

## Household Science Group

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| H. Ec. 6: Advanced Textiles and Clothing | 2⅓ | H. Ec. 7: Advanced Textiles and Clothing | 2⅓ |
| H. Ec. 48: Foods—Advanced Cookery | 2⅓ | H. Ec. 49: Foods—Marketing, Preparation and Serving of Meals | 2⅓ |
| H. Ec. 60: The House | 2⅓ | | |

[3] R indicates that the study is required, without credit, for graduation.

| | |
|---|---|
| Chem. 403: Physiological Chemistry | 3⅓ |
| Ec. Sci. 402: Social Economics | 2 |
| Zool. 112: Human Physiology | 4⅓ |
| H. Ec. 62: Care of the House | 1 |
| | 17⅔[5] |

| | |
|---|---|
| H. Ec. 61: The House | 2⅓ |
| Bact. 18: Bacteriology and Fermentations | 3⅓ |
| *Pub. Sp. 15: Public Speaking | 2 |
| Zool. 150: Human Physiology | 3⅓ |
| Electives | 1⅓ |
| | 17[5] |

* Pub. Sp. 15 is offered both semesters.

SENIOR YEAR

| Seventh Semester | Credits |
|---|---|
| H Ec. 21a: Training in Teaching Home Economics (3), or Electives (2) and H. Ec. 23: Demonstrations (1) | 3 |
| H. Ec. 14: History of Art—Sculpture | 1 |
| H. Ec. 45: Nutrition and Dietetics | 3⅓ |
| **H. Ec. 65: Practice House | R |
| Econ. Sci 329: Household Accounting | 2 |
| Choice: *Agr'l Jour. 8: Beginning Technical Journalism (2) *Engl. 222: Argumentation (2) *Engl. 413: Advanced Composition (2) | 0 or 2 |
| Arch E. 726: History of Architecture | 1 |
| Electives | 6⅔ or 4⅔ |
| | 17[5] |

| Eighth Semester | Credits |
|---|---|
| H Ec 21b: Training in Teaching Home Economics or Electives | 3 |
| H Ec. 12: History of Art—Painting | 2 |
| H. Ec 46: Nutrition and Dietetics | 3⅓ |
| H Ec 47: Home Nursing | 1 |
| Econ Sci 411. Principles of Applied Sociology | 2 |
| *Engl 233: Engl. Classics | 0 or 2 |
| H Ec. 64 Household Management | 2 |
| ***Electives | 3⅔ or 1⅔ |
| | 17[5] |

* Students have the option of taking Engl 233 in the eighth semester in place of Agr'l Jour. 8 or Engl. 222 or Engl. 413 in the seventh

** Two weeks' work in the Practice House will be required of all Senior students.

*** Senior students in class of 1919 will be required to take H .Ec. 62 as an elective in the spring semester.

Students in the Senior College desiring to classify in the Industrial Arts or Physical Culture groups may arrange groups of studies with the classifying Dean.

## Household Art Group

JUNIOR YEAR

| Fifth Semester | Credits[2] |
|---|---|
| H. Ec. 6: Advanced Textiles and Clothing | 2⅓ |

| Sixth Semester | Credits |
|---|---|
| H. Ec. 7: Advanced Textiles and Clothing | 2⅓ |

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Home Economics.

| | |
|---|---|
| H. Ec. 48: Foods—Advanced Cookery | 2⅓ |
| H. Ec. 60: The House | 2⅓ |
| Chem. 380: Textile Chemistry | 3⅓ |
| Econ. Sci. 402: Social Economics | 2 |
| Zool. 112: Human Physiology | 4⅓ |
| H. Ec. 62: Care of the House | 1 |
| | 17⅔[5] |

| | |
|---|---|
| H. Ec. 42: Textiles | 2⅓ |
| H Ec. 49: Foods—Marketing, Preparation and Serving of Meals | 2⅓ |
| H. Ec. 61: The House | 2⅓ |
| H. Ec 54: Textile Design | 1⅓ |
| Bact. 18 Bacteriology and Fermentations | 3⅓ |
| Zool. 150: Human Physiology | 3⅓ |
| | 17⅓[5] |

SENIOR YEAR

Seventh Semester

| | Credits |
|---|---|
| H. Ec. 21a: Training in Teaching Home Economics (3) or Electives (2) and H. Ec. 23: Demonstrations (1) | 3 |
| H. Ec. 14: History of Art—Sculpture | 1 |
| *H. Ec. 37: Millinery | 2⅓ |
| H. Ec 53: Costume Design | 2⅓ |
| **H. Ec. 65: Practice House | R |
| Arch. E. 726. History of Architecture | 1 |
| Econ. Sci. 329: Household Accounting | 2 |
| *Engl. 222: Argumentation | 0 or 2 |
| Pub. Sp 15: Public Speaking | 2 |
| Electives | 3⅓ or 1⅓ |
| | 17[5] |

Eighth Semester

| | Credits |
|---|---|
| H. Ec 21b. Training in Teaching Home Economics or Electives | 3 |
| H. Ec. 12: History of Art—Painting | 2 |
| H Ec 33. Applied Dress Design | 2 |
| H Ec 47: Home Nursing | 1 |
| Econ. Sci. 411: Principles of Applied Sociology | 2 |
| Choice: *Agr'l Jour 8: Beginning Technical Journalism (2); *Engl. 413: Advanced Composition (2); *Engl. 233: English Classics (2) | 2 |
| H. Ec. 64: Household Management | 2 |
| ***Electives | 6 or 4 |
| | 18[5] |

* Students have the option of taking Engl 222 in the seventh semester in place of Agr'l Jour. 8 or Engl 233 or Engl. 413 in the eighth.

** Two weeks' work in the Practice House will be required of all Senior students.

***Senior students in class of 1919 will be required to take H. Ec. 62 as an elective in the spring semester.

## Course in Home Economics and Agriculture (four years)

A degree is awarded on the completion of the required work of this course.

The combined course in Home Economics and Agriculture meets the demands of women who desire training in home economics and sufficient

[2] For definition of a credit see page 81.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Home Economics.

additional training in agriculture to fit them for special fields of work: 1. A surprisingly large number of women in Iowa own farms, and many of them operate these farms. 2. Women who live in the country, but do not manage farms, will benefit by a knowledge of farm principles and practices in addition to their training in home economics. This knowledge of agriculture will increase their efficiency and add much to the enjoyment of the lives of women in the country. 3. Many who teach home economics in high school are also required to teach agriculture. 4. Recently a demand has arisen for women to fill positions as county advisors. To be successful in such work they should have not only training in home economics, but also such instruction in the business of farming as will give them the viewpoint of the woman on the farm and enable them to talk intelligently on agriculture.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1[1]: Types and Market Classes of Beef Cattle and Sheep | 2 | Agr'l Engr. 2: Shop Work | 1 |
| Bot. 161: Plant Morphology | 1⅔ | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 110: General Chemistry and Qualitative Analysis | 3⅓ |
| Engl. 220: Exposition | 3 | Engl. 221: Narration and Description | 3 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain Production | 2⅔ |
| H. Ec. 1 or 5: Elementary, or Intermediate Textiles and Clothing | 2⅓ | H. Ec. 4: Textiles and Clothing or Elective | 2⅓ |
| H. Ec. 41: Personal Hygiene | 1 | H. Ec. 50: Applied Design | 2⅓ |
| Lib. 2: Library Instruction | R[3] | Phys. Cul. 2 or 12: Light Apparatus | R |
| Phys. Cul. 1 or 12: Elementary Gymnastics | R | | |
| | 16⅔ | | 16⅔ |

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| A. H. 42: Poultry Husbandry | 2⅔ | A. H. 43: Poultry Husbandry | 1 |
| Chem. 375: Organic Chemistry | 4⅓ | Chem. 376: Food Chemistry | 3⅓ |
| Dairy 12: Farm Dairying | 2⅔ | Chem. 386: Textile Chemistry | 1 |
| H. Ec. 43: Foods — Selection and Preparation or H. Ec. 73: Foods (1⅔) and Elective (⅔) | 2⅓ | Engl. 29: Literature of Farm and Community Life | 2 |
| | | Farm Man. 2: Farm Management | 2⅔ |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

| | | | |
|---|---|---|---|
| H. Ec. 51: Applied Design | 2⅓ | H. Ec. 44: Foods—Selection and Preparation, or | |
| Hort. 3: General Horticulture | 2⅔ | H. Ec. 74: Foods (1⅔) and Elective (⅔) | 2⅓ |
| Phys. Cul. 3, 5, 7, or 12: Advanced Gymnastics | R | L. A. 41: Rural Improvement | 2 |
| | | Phys. Cul. 4, 6, 8, or 12: Additional Gymnastics | R |
| | | Zool. 51: General Zoology | 3⅓ |
| | 17 | | 17⅔ |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Bot. 560: Botany of Weeds | 1⅔ | Bact. 18: Bacteriology and Fermentations | 3⅓ |
| Econ. Sci. 402: Social Economics | 2 | H. Ec. 7: Advanced Textiles and Clothing | 2⅓ |
| H. Ec. 6: Advanced Textiles and Clothing | 2⅓ | H. Ec. 49: Foods—Marketing, Preparation and Serving Meals | 2⅓ |
| H. Ec. 48: Foods—Advanced Cookery | 2⅓ | Soils 342: Soil Fertility | 3⅓ |
| Zool. 112: Human Physiology | 4⅓ | *Electives | 6⅔ |
| H. Ec. 62: Care of House | 1 | | |
| *Electives | 4⅓ | | |
| | 18[5] | | 18[5] |

* Students expecting to teach after graduation should arrange to elect the following subjects during their Junior and Senior years if the First Grade State Certificate is desired:

| | |
|---|---|
| Ag. Ed. 1: Methods of Teaching | 2 |
| Ag. Ed. 2: Principles of Education | 2 |
| Ag. Ed. 21a and b: Training in Teaching Home Economics, or | |
| Ag. Ed. 31a and b: Training in Teaching Agriculture | 6 |
| Ag. Ed. Elective | 4 |
| Psych. 7: Outlines of Psychology | 3 |
| Psych. 8: Educational Psychology | 3 |
| | 20 |

Students desiring to utilize their elective hours for a special line of work should consult with the head of the department concerned.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| **H. Ec. 65: Practice House | R | Agr'l Engr. 5: Farm Machinery and Farm Motors | 2⅓ |
| H. Ec. 83: Nutrition and Dietetics | 3⅓ | H. Ec. 64: Household Management | 2 |
| Soils 406: Soil Management | 2 | | |

** Two weeks in the Practice House will be required of all Senior students.

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Home Economics.

| | | | |
|---|---|---|---|
| Electives | 11 | Econ. Sci. 424: Rural Sociology | 2 |
| | | H. Ec. 23: Demonstrations | 1 |
| | | H. Ec. 47: Home Nursing | 1 |
| | | Electives | 9⅓ |
| | 18[5] | | 18[5] |

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Household Science | | | |
| Foods | 43[1], 44, 48, 49, 73, 74, 75 | 70 | 101, 102 |
| Hygiene | 41, 47 | | |
| Nutrition and Dietetics | | 45, 46, 83, 84 | |
| Household Management | | 64, 65 | |
| Household Management | 62 | 64, 65 | |
| Household Art | | | |
| Textiles and Clothing | 1, 4, 5, 6, 7, 8, 37, 42 | 33, 81 | 110 |
| Applied Art | 15, 18, 50, 51, 56, 57 | 53, 54, 58, 59, 60, 61 | |
| History of Art | | 12, 14, 16 | |

1. **Textiles and Clothing.** (Drafting and the use of commercial patterns). The designing and making of undergarments, involving the use of fundamental stitches and the use of the sewing machine Household mending, patching and darning. Study of the cotton industry.

1st and 2nd Sem Rec. 1, lab 2, 2 hr ; credit 2⅓; fee $2 00.

4. **Textiles and Clothing.** Continued use of drafted and commercial patterns as the basis of designing and making tailored waist and dress. Emphasis is placed first upon the choice of material from the standpoint of economy and beauty; second, accuracy in cutting, fitting and finishing. Study of the linen industry

2nd Sem. Prerequisite 1, rec. 1; labs 2, 2 hr., credit 2⅓; fee $2 00.

5. **Intermediate Textiles and Clothing.** An intermediate subject for Freshman students who have had one year or more of sewing in accredited high school. If students are not able to carry the work successfully and obtain a grade of eighty-five per cent they will be required to take H. Ec. 1 and 4. The problems are based upon the technical processes involved in the making of both cotton and linen garments. Designing, by using both drafts and commercial patterns.

1st Sem. Lecture 1 hr.; labs. 2, 2 hr ; credit 2⅓; fee $2.00.

6. **Advanced Textiles and Clothing.** Emphasis upon originality of design for a wool dress. Standards for judging line, dark and light, and color harmonies. The use of the electric power sewing machine with

[1] The number refers to the description of the study.

practice in the use of the attachments and the making of the tailored elements appropriate to woolen materials. Study of the wool industry.

5th Sem. Prerequisites 4 or 5, 51; rec. 1; labs 2, 2 hr.; credit 2⅓; fee $2.00.

7. **Advanced Textiles and Clothing.** First problem: the renovation of old material, the combination of old and new materials in the making of a dress. Second problem: a spring gown of light weight material, silk voile, lawn, etc. Study of the silk industry. A comparative study of all textile industries.

6th Sem. Prerequisite 6; rec 1; labs 2, 2 hr; credit 2⅓; fee $2 00.

8. **Advanced Dressmaking.** Drafting systems and commercial patterns. Economical methods of working. Designing and making garments to fill orders. A comparison of factory made and home made garments.

8th Sem. Prerequisites 6 and 7; rec 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

12. **History of Art—Painting.** The history of painting from the early Christian period to the present age. To develop an appreciation of the different masters and their schools and methods in the various centuries and countries—including Renaissance, Dutch, Flemish, French, English, and the modern in Europe and America.

8th Sem. Prerequisite 14; Arch. E. 726; recitations 2; credit 2.

14. **History of Art—Sculpture**. To develop an appreciation of the world's plastic art. The evolution of art will be traced through the ancient Egyptian, Greek, and Roman periods; followed by the history of the sculpture of the early Christian, Gothic, and Renaissance periods as well as that of the 19th and 20th centuries in Europe and America.

7th Sem. Prerequisite 51; Arch. E 726 parallel; recitation 1; credit 1.

15. **Handicraft.** Advanced applied art; original designs made for articles that may be executed in leather, copper, and silver. Various problems in metal-craft and jewelry, sawing, etching, soldering, and repoussé.

5th or 7th Sem. Prerequisite 51; lab. 1, 3 hr; credit 1; fee $5.00.

16. **History of Costume.** Historical survey of ancient Egyptian, Grecian, Roman, early and modern French and English costumes, and their relation to modern dress

3rd or 5th Sem. Prerequisite 4, recitation 1; credit 1

18. **Handicraft.** Continuation of 15, including problems in jewelry, stone setting, and enameling. Elective.

8th Sem. Prerequisite 15; lab 1, 3 hr; credit 1, fee $5 00.

21a. **Training in Teaching Home Economics.** Same as Agr'l Ed. 21a. Courses of study, lesson plans, equipment and text books; history of the Home Economics movement; a minimum of eighteen lessons in observation and practice teaching in the public schools of Ames; demonstrations adapted to foods, clothing, house planning and furnishing, planned for various types of audiences.

6th and 7th Sem. Prerequisite, completion of one semester of Junior year in Home Economics; rec. 2; labs. as arranged; credit 3; fee $2.50.

21b. **Training in Teaching Home Economics.** Same as Agr'l Ed. 21b. Continuation of 21a.

7th and 8th Sem. Prerequisite 21a; recitation 2; labs. as arranged; credit 3; fee $2.50.

23. **Demonstrations.** To train students to give demonstrations that will be useful in presenting Home Economics material to women's clubs, institutes, and other organizations. Required of all senior students not taking H. Ec. 21a and b.

7th or 8th Sem. Lab. 1, 2 hr. and conferences; credit 1; fee $2.50.

33. **Applied Dress Design.** Afternoon or party gowns. Includes designing, cutting, fitting, pattern modeling, draping and modeling gowns on dress form.

8th Sem. Prerequisite 7 and 52; labs. 2, 2 hr.; credit 2; fee $2.00.

H. Ec. 37. **Millinery.** Designing and drafting patterns for hats, the making and covering of buckram frames, the covering of wire frames; the making of various types of trimming such as folds, pleating, cabochons, bows, and flowers; the trimming and lining of hats. Renovation of materials and remodeling of old hats. The selection of hats based upon design principles and knowledge of materials used.

7th Sem. Prerequisite 4; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

41. **Personal Hygiene.** Sanitary care of the person, clothing, and surroundings; social and ethical questions which arise in community and college life.

1st Sem. Recitation 1; credit 1.

42. **Textiles.** A short review of the primitive form of the textile industry; later developments and modern methods of weaving and spinning. A thorough study of the properties, values, manufacture, and finishing of cotton, wool, silk, and linen. The identification of textile materials as to price, width, name, weave, etc.

6th Sem. Prerequisite Chem. 380; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $3.00.

43. **Foods: Selection and Preparation.** Foods, their history, manufacture, production, composition, cost, and economic value. Effect of heat upon foods, and the principles involved in the preparation of typical foods. Special attention to acquiring ease and accuracy in the actual cooking processes.

Either Sem. Prerequisite Chem. 110; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $5.00.

44. **Foods: Selection and Preparation.** Continuation of 43.

4th Sem. Prerequisite 43; recitation 1; labs. 2, 2 hrs.; credit 2⅓; fee $5.00.

45. **Nutrition and Dietetics.** Fundamental principles of human nutrition and the application of these principles under varying physiological, economic, and social conditions; laboratory problems in the planning and preparation of dietaries for various types of normal individuals in infancy, childhood, adolescence, adult life, and old age. For the family group with diverse conditions of activity, age, and financial circumstances.

7th Sem. Prerequisites Chem. 403, Zool. 150, and H. Ec. 49; recitation 1; labs. 2, 3 hr.; credit 3⅓; fee $6.00.

46. **Nutrition and Dietetics.** Continuation of 45, with a study of therapeutic cookery and special attention to diet in disease.

8th Sem. Prerequisite 45; recitation 1; labs. 2, 3 hrs.; credit 3⅓; fee $6.00.

47. **Home Nursing and Public Health.** Scientific care of the patient

under home conditions, including the location, furnishing, temperature, and ventilation of the room; bathing, dressing, and administering food and medicine to patients; bed making; bandaging; lifting helpless patients; preparation and application of fomentations.

8th Sem. Prerequisite, Bact. 18; recitation 1; credit 1.

48. **Foods: Advanced Cookery.** Food preservation and conservation, including lessons in canning, drying and pickling of foods, the making of war breads and all other possible substitutions for wheat, as well as substitutes for animal fat, meat and sugar.

5th Sem. Prerequisite Chem. 376; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $5.00.

49. **Foods: Marketing, Preparation and Serving of Meals.** Practice in making of the menu with reference to the season, cost, availability of foods, and combinations suitable to existing conditions. Marketing, cooking and serving of the daily home meals, and meals for special occasions. The work in this subject sums up all previous sophomore and junior food work.

6th Sem. Prerequisite 48; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $5.00.

50. **Design.** Principles of design: proportion, subordination, rhythm, balance; value of tones and theory of color. These fundamental principles are applied to simple abstract problems in lettering, spacing, etc., and furnish the basis for specific problems offered in H. Ec. 51.

Either Sem. Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

51. **Applied Design.** Perspective exemplified in simple sketches of still-life, furniture and architecture. Application of principles of design and color harmony to concrete problems, including designs for fabrics, useful articles, and decorative posters.

3rd Sem. Prerequisite 50; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

53. **Costume Design.** The art principles underlying the designing of costumes; the influence of technical processes upon design; the costume in relation to individual, social, and commercial conditions. The purpose of the course is to give the artistic and practical experience which may lead to specialization along the following vocational lines: home dress-making, costume designing, and costume illustrating.

7th and 8th Sem. Prerequisites 51 and 7; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.00.

54. **Textile Design.** Design applied to various textile problems involving different techniques and methods, such as embroidery, woodblock, stencil, tied and dyed work, and resist printing. Planned to meet the special needs of students who elect the course in Household Arts.

6th Sem. Prerequisite 51; labs. 2, 2 hr.; credit 1⅓; fee $3.00.

56. **Interior Design.** Detail of the architectural features of various rooms of the modern house. (Ex. fireplaces, grouping of windows, doors, stairways, etc.) Choice of furnishings, color schemes and detail budgeting of cost for each room of medium sized house.

Practice in drawing details and applying color harmony to elevations and floor plans of such rooms, which will give the student some idea of

the requirements made by professional "Interior Decorating" firms should the aim be to specialize in the commercial field. Elective.

7th and 8th Sem. Prerequisites H Ec. 51 and 61; labs. 2, 3 hr; credit 2; fee $2 00

57. **Industrial Handiwork.** A series of problems in various mediums which might be used by teachers of playground and "open air" classes. It will include a few lessons in each of the following subjects:

Paper folding, basketry, clay modelling, weaving (hand and loom), knitting, and toy making. Elective.

5th or 6th Sem. Prerequisite H. Ec 51; lab. 1 or 2, 3 hr; credit 1 or 2; fee $3 00.

H. Ec. 58. **Historic Design in Furniture.** Various styles of period furniture, with problems in the adaptation of the structural and ornamental features to modern furniture

7th Sem Prerequisite H. Ec. 61; lab 1, 3 hr; credit 1; fee $1 00.

H Ec. 59. **Household Industries.** A brief study. Research problems and discussions on manufacturing processes of various articles of the home.

8th Sem Prerequisite 61; lecture 1, lab 1, 3 hr, credit 2, fee $1 00

60. **The House.** Evolution of domestic architecture. Relation of historic art to American homes Consideration of choice of site, essential elements in planning, construction and materials to meet the ideals of a modern home Also water, heating, plumbing, ventilating and lighting systems.

Original plans for a given lot, on a limited sum, are developed by each student. Also sketches of exterior elevations involving proportion, balance and color harmony as related to environment. The laboratory is equipped with a small model house built to the scale of three-fourths inch to the foot. During each semester several trips are made to the Practice House for the study of building and furnishing problems.

5th Sem. Prerequisites 50 and 51; recitation 1, labs. 2, 2 hr, credit 2⅓; fee $2 00.

61. **The House.** Continuation of 60. The interior and complete furnishing of a house Lectures on proportion, line, and spacing of architectural features, color schemes, historic styles of furniture, wall and wood finishes, floor coverings, draperies, and accessories. Practice in developing color harmonies for various rooms The final problem involves the choice of suitable furnishings and estimation of total cost of an ideal modern home.

6th Sem. Prerequisite 60; recitation 1; labs 2, 2 hr; credit 2⅓; fee $2 00.

H. Ec. 62. **Care of the House.** The development of greater personal efficiency in relation to the daily household tasks, through unit time, method and motion studies The technique of the care of the house will be developed through the laboratory work, dealing with the treatment of woods, metals, glass, textiles, etc, and with problems of renovation.

5th Sem Prerequisites Physics 330, Chem 375, lab 1, 2 hr, outside work 1 hr, credit 1; fee $2 00

H. Ec 64. **Household Management.** Designed to unify the impressions received by the student from preceding studies in Home Economics.

with a personal application to her problems as a college woman and as a future professional woman and homemaker. The elements of successful homemaking; the woman and the standard of living; her rôle of spender, with budget studies. The responsibility of the woman to her family and the community in establishing standards of consumption, of hospitality, of family life, and of social service will be developed.

8th Sem. Prerequisite Econ. Sci. 402; recitations 2; credit 2.

65. **Practice House.** At periods arranged during the year senior students will spend two weeks in the practice house in actually working out problems of household management. The work of the household will be divided among the six students in residence. This arrangement will provide for practice in each of the following duties: hostess, cook, waitress, maid, laundress. The purpose of the work will be to give practical experience in buying, household accounting, planning and serving meals, and other problems in the management of a home. Four dollars per week will be paid by each student during residence to meet living expenses incurred.

Required.

70. **Experimental Problems in Foods.** Types of cooking apparatus; comparison of the cost of fuels; types of food products, and the changes which occur in the preparation of foods. Elective.

6th or 8th Sem. Prerequisite, Chem. 376, Physics 330, H. Ec. 44 or 74; recitation 1; labs. 2, 2 hr; credit 2⅓; fee $5 00.

73. **Foods.** History, manufacture, production, composition, cost, and economic value. Preparation of typical foods. Arranged for students who have had one or more years in Foods in accredited high schools. Students not able to carry the work in this intensive course will be required to take H. Ec. 43 and 44.

3rd Sem. Prerequisite, Chem. 110; recitation 1, lab. 1, 2 hr; credit 1⅔; fee $4 00

74. **Foods.** Continuation of 73.

4th Sem. Prerequisite 73; recitation 1; lab 1, 2 hr; credit 1⅔; fee $4.00.

75. **Camp Cookery.** Composition, food value, cost, and cooking of foods adaptable to camp life. Elective for men students.

Both Sems Labs 2, 2 hr; credit 1⅓; fee $4.00.

81. **Economic Clothing.** A general survey of the conditions under which ready-made clothing is produced, including a very careful study of ready-made garments and a comparison between factory made and home made garments as to design, quality of cloth, workmanship, durability, cost, etc. Clothing budgets for various incomes will be worked out.

8th Sem. Prerequisites 6 and 7; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.00.

83. **Nutrition and Dietetics.** A brief survey of the problems involved in nutrition and dietetics; laboratory problems in the study of food values, and in the planning of foods for the family under varying conditions. Required of students in the Home Economics and Agriculture course. Elective for Household Art students.

7th Sem. Prerequisite Chem. 376, Zool 150, H. Ec. 49; recitation 1; labs. 2, 3 hr.; credit 3⅓; fee $6.00.

84. **Nutrition Seminar.** Recent advances in the science of nutrition. For undergraduate students.

**Prerequisite H. Ec. 45; credit 1 to 2 hrs.; time to be arranged.**

101. **Nutrition Seminar.** Recent advances in the science of nutrition with class reports and discussions upon assigned topics. For graduate students.

**Prerequisite H. Ec. 46; credit 1 to 2 hrs.; time to be arranged.**

102. **Research in Food and Nutrition.**

**Prerequisite H. Ec. 45; hours to be arranged; fee ____.**

110. **Textile Research.**

**Prerequisite 42.**

## HORTICULTURE AND FORESTRY

PROFESSOR BEACH, Agricultural Hall, Room 201

Associate Professors Culley, Harrington; Assistant Professor Thurston; Instructors Stonecifer, Piester; Fellow Hartman; Extension Staff: Herrick, Fitch, Pearse, Allison; Florist Reardon

*For information concerning the Division of Agriculture, see page 45.*

This Department includes these major lines of work:

FLORICULTURE. See page 231.

FORESTRY. See page 199.

LANDSCAPE ARCHITECTURE. See page 240.

POMOLOGY AND GENERAL HORTICULTURE. See page 229.

TRUCK CROPS AND MARKET GARDENING. See page 234.

The studies in Forestry are listed under Forestry, page 199. Those in Landscape Architecture are listed under Landscape Architecture, page 240. Those in Floriculture, General Horticulture, Pomology, Truck Crops and Market Gardening are listed under Horticulture, page 228.

### HORTICULTURE

It is the aim to teach in a logical way the fundamental principles underlying horticultural practice, supplement this freely with demonstrations, and bring the student into contact with the practical operations. The technical subjects are well supported by work in fundamental science and cultural subjects.

In the way of equipment the department is well provided. Directly connected with the campus are orchards, nurseries, vineyards, gardens and a well equipped fruticetum. By courtesy of the Experiment Station this department has the privilege of giving instruction at the State Experiment Orchard at Council Bluffs and at the Fruit Breeding Farm at Charles City. It has a large and well equipped plant laboratory building together with greenhouses having over 30,000 feet under glass. Thus the department is able to furnish good opportunities for the student in horticulture to become acquainted with various horticultural operations as carried on both under glass and in the field.

There are good openings for horticultural graduates in fruit growing, truck farming, floriculture, managing and superintending commercial fruit

and vegetable farms. Positions are also open for managers of coöperative associations, for teachers in colleges, academies, and high schools, and for extension experts in agricultural colleges, railroads, land companies, and horticultural associations. Government and experiment station lines of work also afford permanent and profitable employment.

## Courses in Horticulture

Leading to the degree of Bachelor of Science in Horticulture.

NOTE: The courses for Agricultural Education, Animal Husbandry, Dairying, Farm Crops and Soils, Farm Management, Pomology, Truck Crops, and Horticulture are the same until the beginning of the Sophomore year, but students in Floriculture have the option of taking the Forestry Freshman year.

In each of the above courses six months of practical work in Agriculture, under the direction of the departments concerned, is required before graduation. See page 97.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| A. H. 1: Types and Market Classes of Beef Cattle and Sheep | 2 | A. H. 2: Types and Market Classes of Dairy Cattle, Horses, and Swine | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Farm Cr. 1: Corn Production | 2⅔ | Farm Cr. 2: Small Grain | 2⅔ |
| **Group Studies | 5⅓ | **Group Studies | 5⅓ |
| Lib. 1: Library Instruction (four hours for semester) | R | Mil. Sci. 2: Military Art | 1 |
| *Math. 17: Algebra and Trig. | 3 | Phys. Tr. 2: Advanced Physical Training | R |
| Mil. Sci. 1: Military Art | 1 | Phys. 205: Mechanics, Heat, and Light | 2⅔ |
| Phys. Tr. 1: Physical Training | R[3] | | |
| | 18 | | 17⅔ |

* Freshmen who show deficient preparation in mathematics may be assigned, by the Dean of the Junior College and the Dean of Agriculture, to a special class, with one hour more work than indicated above; and in case of clear indication of failure even with this arrangement they will be dropped from the Freshman work until they have given proof of sufficient preparation to enable them to carry the work successfully.

** Group Studies:

In order to equalize the class work one of these groups will be required during each semester of the Freshman year.

| Group 1 | | Group 2 | |
|---|---|---|---|
| Dairy 12: Farm Dairying | 2⅔ | Agr'l Engr. 1 or 2: Shop Work | 1 |
| Hort. 3: General Horticulture | 2⅔ | Agr'l Engr. 29: The Graphic Method | ⅔ |
| | | Bot. 161: Plant Morphology | 1⅓ |
| | | Forestry 1: Farm Forestry | 2 |
| | 5⅓ | | 5⅓ |

For Two-year Collegiate Course in Horticulture, see page 96.

## POMOLOGY *

Leading to the degree of Bachelor of Science in Pomology.

For the Freshman year, see above.

* For Floriculture group see page 231; for Truck Crops and Market Gardening, page 234; for Landscape Architecture, page 240.

[1] The number refers to the description of the study.

[2] For definition of a credit see page 81.

[3] R indicates that the study is required, without credit, for graduation.

SOPHOMORE YEAR

| Third Semester | Credits[2] | Fourth Semester | Credits |
|---|---|---|---|
| Hort. 102[1]: Commercial Orcharding | 2 | Hort. 2: Horticulture Practice | 2⅔ |
| Bot. 268: Vegetable Physiology | 3⅓ | Hort. 38: Plant Propagation | 2 |
| Bot. 308: Plant Pathology of Horticultural Plants | 2⅔ | Agr'l Engr. 37: Agricultural Surveying | 2⅔ |
| Chem. 351: Applied Organic | 3⅓ | Agr'l Engr 22: Mechanics and Machinery | 1⅓ |
| Engl. 18: Narration and Description | 3 | Bot. 470: Systematic Spermatophytes | 2⅔ |
| Farm. Man. 1: Farm Accounts | 1⅓ | Econ. Sci. 110: Agricultural Economics | 3 |
| Hist. 24: Economic History of American Agriculture | 2 | Engl 19: Exposition | 3 |
| Mil. Sci 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys Tr. 3· | R[3] | Phys. Tr. 4: | R |
| | 19⅓ | | 18⅔* |

* With consent of classifying officer the student may elect Pub Sp 2, 1 credit

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| **Agr'l Engr. 1 or 2: Shop Work | 1 | Hort. 103· Pomology Practice | ⅔ |
| Gen 1· General Genetics | 2⅔ | Hort 138· Inspection Tour | R |
| Hort. 101: Systematic Pomology | 3⅓ | † Choice: Agr'l Ed 2· Principles of Education (2) / Pub. Sp 10· Extempore Speech (2) | 2 |
| †Hort 106: Fruit and Vegetable Judging | 2⅔ | Bact. 2: General Bacteriology | 3⅓ |
| Choice: †Agr'l Jour 8: Beginning Technical Journalism (2) / †Agr'l Ed. 1: Methods of Teaching (2) / †Pub Sp. 2: Fundamentals (1) | 1 or 2 | ***Soils 201: Soil Bacteriology | 0 or 3⅓ |
| | | Soils 342· Soil Fertility | 3⅓ |
| | | Zool. 344 Horticultural Entomology | 3⅓ |
| | | †Mil. Sci 10 Military Art | 1 |

**Students expecting to teach after graduation are urged to elect Ag. Ed. 1 and 2 during the junior year. This will permit the work in practice teaching during the senior year. See further details under Teachers' Certificates.**

** Will not be required of students who had A E. 1 and 2 in their Freshman year

*** Students have the option of taking Soils 201 in either the sixth or eighth semester or of taking either Soils 202, 2 credits, or Soils 513, 1⅔ credits, in the seventh semester in place of Soils 201.

[1] The number refers to the description of the study.

[2] For definition of a credit see page 81.

[3] R indicates that the study is required, without credit, for graduation

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270

| | | | |
|---|---|---|---|
| Bot. 124: Plant Embryogeny | 1⅔ | †Electives | 5⅓ or 2 |
| Soils 141: Soil Physics | 3⅓ | | |
| Zool. 304: General Entomology | 3⅓ | | |
| †Mil. Sci. 9: Military Art | 1 | | |
| | 19-20 | | 19 |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Hort 6 a or b: Markets and Marketing | 1 or 2 | Hort. 10: History and Literature of American Horticulture | 2 |
| Hort. 29: Seminar | R | Hort. 29: Seminar | 1 |
| Hort. 105: Fruit Farm Management | 2 | Hort. 104: Grapes and Small Fruits | 2⅔ |
| L. A. 41: Rural Improvement | 2 | Hort. 110: Advanced Pomology | 1 |
| Choice: Hort. 333: Truck Farming (2); Hort 142: Special Problems (2); Hort. 143: Thesis (2); Hort 144: Thesis (R) | R or 2 | Hort. 143 or 144 Thesis | 2 or 3 |
| Choice: Soils **202: Soil Bacteriology (2); Soils **513: Soil Surveying and Mapping (1⅔) | 0, 1⅔ or 2 | Choice: Agr'l Jour 7: Agricultural Advertising (1); Agr'l Jour. 9: Technical Journalism Practice (2) | 1 or 2 |
| Choice: Engl 412: Argumentation (2); Engl 29: Literature of Farm and Community Life (2) | 2 | †Electives | 8⅓ or 6⅓ |
| Econ. Sci 118: Marketing Agricultural Products | 2 | †Mil Sci 12: Military Art | 1 |
| †Electives | 9 to 4 | | |
| †Mil. Sci. 11: Military Art | 1 | | |
| | 19 | | 19 |

** Students have the option of taking in the sixth or eighth semester Soils 201, 3⅓ credits, in place of either Soils 202, 2 credits, or Soils 513, 1⅔ credits in the seventh semester.

*** The Senior electives shall include either 5 credits in R O T. C., see page 270, not less than 2 credits in History, Psychology, Literature, Music, or Agricultural Education, and 2 credits in Economic Science, Farm Management, or Biology.

## Floriculture

Leading to the degree Bachelor of Science in Floriculture

For Freshman year see either page 200 or 229

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Hort. 203a: Floriculture Practice | ⅔ | Hort. 2: Horticultural Practice | 2⅔ |
| Hort. 233: Greenhouse Management | 1⅓ | Hort. 38: Plant Propagation | 2 |
| *Bot. 268: Plant Physiology | 3⅓ | Hort. 206: Greenhouse Construction | 1 |
| Bot. 308: Pathology of Horticultural Plants | 2⅔ | L. A. 41: Rural Improvement | 2 |
| Chem. 351: Applied Organic Chemistry | 3⅓ | Agrl. Eng. 22: Mechanics and Machinery | 1⅓ |
| *Engl. 18: Narration and Description | 3 | Bot. 470: Systematic Spermatophytes | 2⅔ |
| *Hist. 24: Economic History of American Agriculture | 2 | Ec. Sci. 110: Agricultural Economics | 3 |
| Public Sp. 2: Fundamentals | 1 | *Engl. 19: Exposition | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3: | R[3] | Phys. Tr. 4: | R |
| | 19 | | 19 |

* If the student has Forestry Freshman credits in group 1 below he shall take the subjects listed in group 2. Botany 269 will be accepted in place of Bot. 268, and Hist. 20 in place of Hist. 24.

Group 1

| | Credits |
|---|---|
| Bot. 269: Plant Physiology | 3⅓ |
| Engl. 18: Narration and Description | 3 |
| Eng. 19: Exposition | 3 |
| Hist. 20: Industrial History of U. S. | 2 |

Group 2

Third Semester

| | Credits |
|---|---|
| Agrl. Eng. 29: The Graphic Method | ⅔ |
| Hort. 3: General Horticulture | 2⅔ |
| Phys. 205: Mechanics, Heat and Light | 3 |
| Total semester | 17 |

Fourth Semester

| | |
|---|---|
| L. A. 31: Plant Materials | 3 |
| Total semester | 19 |

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Hort. 234: Greenhouse Management | 2⅔ | Hort. 203b: Floriculture Practice | ⅔ |
| Choice: Agr'l Ed. 1: Methods of Teaching (2); Pub. Sp. 10: Extempore Speech (2); Hort. 333: Truck Farming (2); L. A. 32: Plant Materials (2) | 2 | Hort. 209: Garden Flowers | 2⅔ |
| Bot. 124: Plant Embryogeny | 1⅓ | Hort. 235: Greenhouse Management | 1 |
| | | † Choice: Agr'l Ed. 2: Principles of Education (2); Agr'l Jour. 8: Beginning Tech. Journalism (2) | 2 |
| | | Bact. 2: General Bacteriology | 3⅓ |
| | | †Mil. Sci. 10: Military Art | 1 |

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

| | |
|---|---|
| Gen. 1: General Genetics | 2⅔ |
| †Mil. Sci. 9: Military Art | 1 |
| Soils 141: Soil Physics | 3⅓ |
| Zool. 304: General Entomology | 3⅓ |
| Choice {†Electives (2) or A. E. 1 or 2 (1), El. (1)} | 2 |
| | 18⅔[5] |

| | |
|---|---|
| Soils 342: Soil Fertility | 3⅓ |
| Zool. 344: Horticultural Entomology | 3⅓ |
| †Electives | 1⅔ |
| | 19 |

**Students expecting to teach after graduation are urged to elect Agr'l Ed. 1 and 2 during the Junior year. This will permit the work in practice teaching during the senior year. See further details under Teachers' Certificate.**

SENIOR YEAR

Seventh Semester

| | Credits |
|---|---|
| Hort. 29: Seminar | R |
| Hort. 202: Floral Arrangement and Judging | 1⅔ |
| Hort. 203c: Floriculture Practice | ⅔ |
| Hort. 210: Commercial Floriculture | 2⅔ |
| Choice {Hort. 242: Special Problems (1 or 2) / Hort. 243, 244: Thesis (2 or R)} | R, 1 or 2 |
| L. A. 44: General Landscape Design | 2 |
| Choice {Agr'l Jour. 7: Agricultural Advertising (1) / Agr'l Jour. 9: Technical Jour. Practice (2)} | 1 or 2 |
| Choice {Engl. 412: Argumentation / Engl. 29: Literature of Farm and Community Life} | 2 |
| Choice {*Soils 202: Soil Bacteriology (2) / *Soils 513: Soil Surveying and Mapping (1⅔)} | 0, 1⅔ or 2 |
| Zool. 359: Greenhouse Pests | 2 |
| †Mil. Sci. 11: Military Art | 1 |
| †**Electives | 4⅔ to ⅔ |
| | 18⅔ |

Eighth Semester

| | Credits |
|---|---|
| Hort. 29: Seminar | 1 |
| Hort. 203d: Floriculture Practice | ⅔ |
| Hort. 211: Commercial Floriculture | 1 |
| Hort. 243 or 244: Thesis | 2 or 3 |
| Hort. 304: Market Gardening | 1 |
| Choice {Hort. 10: History of American Hort. (2) / Hort. 305: Truck Farm Management (1)} | 1, or 2 |
| A. E. 37: Agricultural Surveying | 2⅔ |
| †Mil. Sci. 12: Military Art | 1 |
| *Soils 201: Soil Bacteriology | 0 or 3⅓ |
| †**Electives | 8⅔ or 3⅓ |
| | 19 |

*** Students have the option of taking Soils 201 in the eighth semester in place of either Soils 513 or Soils 202 in the seventh semester.**

**** The Senior electives shall include not less than two credits in History, Psychology, Literature, Music, or Agricultural Education and two credits in Economic Science, Farm Management or Biology.**

**† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.**

## Truck Crops and Market Gardening

Leading to the degree of Bachelor of Science in Truck Crops and Market Gardening.

For Freshman year, see page 229.

Sophomore year same as for Pomology, page 230.

### JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Hort. 234: Greenhouse Management | 2⅔ | †Hort. 104: Grapes and Small Fruit | 2⅔ |
| Hort. 333: Truck Farming | 2 | Hort. 206. Greenhouse Construction | 1 |
| † Choice: Hort. 137: Orchard Practice (1) / L. A. 41: Rural Improvement (2) | 1 | Hort 235: Greenhouse Management | 1 |
| † Choice: Agr'l Ed. 1: Methods of Teaching (2) / Econ. Sci. 118: Marketing Agricultural Products (2) | or 2 | Hort. 303· Truck Crops Practice | ⅔ |
| Bot 124· Plant Embryogeny | 1⅔ | Choice: Agr'l Ed 2: Principles of Education (2) / Agr'l Jour. 8· Beginning Tech. Journalism (2) | 2 |
| †Mil. Sci 9· Military Art | 1 | Pub Sp 10: Extempore Speech | 2 |
| Soils 141: Soil Physics | 3⅓ | Bact 2· General Bacteriology | 3⅓ |
| Zool 304· General Entomology | 3⅓ | †Mil Sci. 10 Military Art | 1 |
| *Agr'l Engr 1 or 2· Shop Work | 1 | Soils 342 Soil Fertility | 3⅓ |
| | | Zool 344. Horticultural Entomology | 3⅓ |
| | 18⅔-19⅔ | | 18⅓ |

**Students expecting to teach after graduation are urged to elect Agr'l Ed 1 and 2 during the Junior year This will permit the work in practice teaching during the senior year See further details under Teachers' Certificate.**

* Will not be required of students who had A E 1 and 2 in their Freshman year

### SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Hort. 6. Markets and Marketing | 1 or 2 | Hort. 29 Seminar | 1 |
| Hort 29· Seminar | R | Hort. 304 Market Gardening | 1 |
| Hort. 106. Fruit and Vegetable Judging | ⅔ | Hort. 305. Truck Farm Management | 1 |
| Hort. 301. Handling Truck Crops | 1 | Hort. 342 or 344· Thesis | 2 or 3 |
| | | L A. 41· Rural Improvement | 2 |
| | | †Mil Sci 12. Military Art | 1 |

† May be omitted by students appointed to the Reserve Officers' Training Corps For full information, see page 270

| | | |
|---|---|---|
| †Mil. Sci. 11: Military Art | | 1 |
| Choice | Hort. 210: Commercial Floriculture (2⅔) | 1⅔ |
| Choice | Hort. 306: Fruit and Vegetable Products (1⅔) | or 2⅔ |
| Choice | Hort. 342: Special Problems (1 or 2) | R, 1 |
| Choice | Hort. 343, 344: Thesis (2 or R) | or 2 |
| Choice | Agr'l Jour. 7: Agr'l Advertising (1) | 1 |
| Choice | Agr'l Jour 9 · Tech. Jour. Practice (2) | or 2 |
| Choice | Engl. 412: Argumentation (2) | 2 |
| Choice | Engl. 29: Literature of Farm and Community Life (2) | |
| Choice | *Soils 202: Soil Bacteriology (2) | 0, 1⅔ |
| Choice | *Soils 513: Soil Surveying and Mapping (1⅔) | or 2 |
| Zool. 359: Greenhouse Pests | | 2 |
| **Electives† | | 8⅔ to 2⅔ |
| | | 19 |

| | |
|---|---|
| *Soils 201: Soil Bacteriology | 0 or 3⅓ |
| **Electives† | 10 to 5⅔ |
| | 18 |

* Students have the option of taking Soils 201 in the eighth semester in the place of either Soils 202 or Soils 513 in the seventh semester.

** The electives shall include not less than 2 credits in History, Psychology, Literature, Music, or Agricultural Education, and 2 credits in Economic Science, Farm Management, or Biology

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| General Horticulture and Plant Genetics | 1[1], 2, 3, 9, 10, 13, 29, 38, 49, 50 | 6, 7 | 58 |
| Pomology | 101, 102, 103, 104, 106, 107, 137, 142, 143, 144 | 105, 110 | 152 |
| Floriculture | 201, 202, 203, 205, 206, 207, 208, 209, 210, 211, 234, 242, 243, 244 | 235 | 252 |
| Truck Crops and Market Gardening | 301, 302, 303, 333, 342, 343, 344 | 304, 305 | 352 |

[1] The number refers to the description of the study.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

The following studies in this department have been omitted from the Catalogue for the period of the war: 207, 208.

GENERAL HORTICULTURE

1. **General Horticulture.** Commercial fruit growing and truck crops considered with especial reference to the needs of agricultural engineering students. Not open for credit to students having credit for either 3, 204, 333, or 430.

5th Sem. Recitation 1; lecture and lab. 1, 2 hr.; credit 2; fee $1.00.

2. **Horticulture Practice.** Philosophy of rational horticultural practice; field work with injurious insects and diseases; spraying, spray mixing, planting plans, pruning, top working, and other horticultural field operations.

4th Sem. Prerequisite 1 or 8; lectures 2; lab. 1, 4 hr. last half of semester; credit 2⅔; fee $1.00.

3. **General Horticulture.** Fruit growing and vegetable culture. General exercises in propagation, planting, and management of fruits and vegetables.

1st or 2nd Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.00.

6. **Markets and Marketing.** Horticultural marketing problems; general and special markets; individual and coöperative buying and selling.

7th Sem. Prerequisites 102 or 801, Ec. Sci. 118; recitations 1 or 2; (a) 1 credit; (b) 2 credits.

7. **Plant Breeding.** Advanced study of problems and technique of breeding horticultural plants.

Either Sem. Recitations, 1; lab. 1, 3 hr.; credit 2.

9. **Special Problems.** Special investigation under the supervision of some member of the department staff in topics pertaining to general horticulture or plant breeding.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1; (b) credit 2.

10. **History and Literature of American Horticulture.** Survey of its development.

8th Sem. Prerequisites 101, 106, 235, 301, or 410; recitations 2; credit 2.

13. **Thesis.** Special subject pertaining to general horticulture or plant breeding which requires some independent investigation; results to be presented in a written report. May be a continuation of 9.

7th or 8th Sem. 6 hrs. work per week; credit 2.

29. **Seminar.** Preparation and discussion of papers on special horticultural topics. Continues through 7th and 8th semesters. Credit given at close of 8th semester.

7th and 8th Sem. Credit 1.

38. **Plant Propagation.** Asexual and sexual methods; germinating, testing, and storage of seeds; multiplication of plants by cuttage, layerage, and graftage; nursery methods and management.

4th Sem. Prerequisite Chem. 351; recitation 1; lecture and lab. 1, 2 hr.; credit 2; fee $1.00.

49. **Special Problems.** Investigation in some work along the lines of general horticulture or plant breeding under the supervision of a member of the department staff.

6th or 7th Sem. Recitation 1; credit 1.

50. **Thesis.** Special subject pertaining to general horticulture or plant breeding which requires some independent investigation; the results to be presented in written report. May be a continuation of 9.

7th and 8th Sem. Recitation 1 each semester, with 5 hrs. additional weekly in the 8th semester; credit 3.

58. **Thesis or Research.** Special topics for investigation for minor or major graduate work. PROFESSOR BEACH; ASSOCIATE PROFESSOR HARRINGTON; CHIEFS ERWIN, MANEY

Hours by appointment.

POMOLOGY

101. **Systematic Pomology.** Botanical and pomological classification; geographical origin and distribution under cultivation of leading pomological plants; description of varieties.

5th Sem. Prerequisite 1 or 3; lectures 2; labs. 2, 2 hr.; credit 3⅓; fee $2.00.

102. **Commercial Orcharding.** Management of commercial orchards; handling orchard crops; pruning, spraying, harvesting, grading, and storing; orchard by-products; selection, preparation, and management of orchard soils.

3rd Sem. Prerequisite 1 or 3; recitations 2; credit 2.

103. **Pomology Practice.** Field practice in pomology supplementing 2 and 102.

6th Sem. Prerequisite 2; lab. 1; credit ⅔.

104. **Grapes and Small Fruits.** Culture, harvesting, and marketing of the strawberry, raspberry, grape, currant, and other small fruits.

6th Sem. Prerequisite 1, 3, or 38; recitations 2; lab. 1, 2 hr.; credit 2⅔.

105. **Fruit Farm Management.** Advanced problems in the location, development, and maintenance of orchards, vineyards, and small fruit plantations; soil management; special problems in fruit harvesting, storage, transportation, and marketing.

7th Sem. Prerequisite 104 or 106; credit 2.

106. **Fruit and Vegetable Judging.** Installation, scoring, and judging fruit and vegetable exhibits.

5th Sem. Prerequisite 2, 38, or 101; lab. 1; credit ⅔; fee $2.00.

107. **Fruit and Vegetable Judging.** Continuation of 106.

7th Sem. Prerequisite 106; lab. 1; credit ⅔.

110. **Advanced Pomology.** Advanced problems in fruit growing, including selection of pomological varieties with reference to management and adaptation to environment.

8th Sem. Prerequisites 2 and 101; lecture 1; credit 1.

137. **Orchard Practice.** Field practice in handling fruit; harvesting, grading, packing, and other commercial orchard operations. Work assigned for stated periods where the student gets practical experience in the above named operations under the direction of an instructor.

5th Sem. Prerequisite 2, 38, or 101; credit 1.

138. **Inspection Tour.** Immediately following the close of the 6th semester an inspection tour is required. A trip of from five to ten days

is made through commercial fruit growing districts under the direction of the instructor.

Credit R.

142. **Special Problems.** Special investigation under the supervision of some member of the department staff.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1, (b) credit 2

143. **Thesis.** A special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 142.

7th or 8th Sem 6 hrs per week, credit 2

144. **Thesis.** Special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 142.

7th and 8th Sem Recitation 1 each semester with 5 hrs additional weekly in 8th semester; credit (given at close of 8th Sem.) 3

152. **Thesis or Research.** Special topics for investigation for major or minor graduate work.

PROFESSOR BEACH, ASSOCIATE PROFESSOR HARRINGTON, CHIEF MANEY

Hours by appointment

### FLORICULTURE

201. **Amateur Floriculture.** Floriculture in relation to the home; care of house plants; the flower garden; floral decoration. Lectures supplemented with practice work

7th Sem. Lecture 1; lab. 1, 2 hr; credit 1⅔

202 **Floral Arrangement and Judging.** Principles and methods of cut flower arrangement; interior decoration; exhibiting and judging flowers and plants.

7th Sem. Prerequisite 234, lecture and lab 1, 2 hr, credit 1; fee $1.00.

203 (a), (b), (c), (d) **Floriculture Practice.** Garden and greenhouse work supplementing 2

Either Sem. Prerequisite (or required with this study) 2; lab 1, 2 hr; credit ⅔.

205. **Home and School Gardening.** Gardening for women in which the home flower garden, the vegetable garden, selection and care of house plants, propagation, selection and management of garden flowers and vegetables are considered.

Either semester Lecture and lab 1, 2 hr, credit 1

206. **Greenhouse Construction.** Various types of houses; construction; principles and methods of heating; preparation of plans and specifications for commercial and private ranges

5th Sem. Lecture and lab 1, 2 hr, credit 1

209. **Garden Flowers.** Selection and management of garden flowers, annuals, herbaceous perennials, bulbs, bedding plants, and roses.

6th Sem. Lectures 2; lab. 1, 2 hr, credit 2⅔

210. **Commercial Floriculture.** Propagation of florists' bench crops and potted plants

7th Sem. Prerequisite 234, lectures 2, lab 1, 2 hr.; credit 2⅔.

211. **Commercial Floriculture.** Continuation of 210. Special attention given to marketing of cut flowers and the organization and management of the retail store.

8th Sem. Prerequisite 210; lecture and lab. 1, 2 hr.; credit 1.

233. **Greenhouse Management.** Introductory course; greenhouse organization and operations.

3rd Sem. Lectures 2; lab. 1, 2 hr.; credit 2⅔.

234. **Greenhouse Management.** Greenhouse crops and their cultural requirements, including propagation, potting, watering, ventilation, and heating.

5th Sem. Prerequisite 38; lectures 2; lab. 1, 2 hr.; credit 2⅔.

235. **Greenhouse Management.** Continuation of 234 designed to give the student practical experience with the various greenhouse operations through the different seasons of the year.

6th Sem. Prerequisite 234; lecture and lab. 1, 2 hr.; credit 1.

242. **Special Problems.** Special investigation under the supervision of some member of the department staff.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1; (b) credit 2.

243. **Thesis.** A special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 242.

7th or 8th Sem. 6 hrs. work per week; credit 2.

244. **Thesis.** A special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 242.

7th and 8th Sem. Recitation 1 each semester with 5 hours additional weekly in 8th semester, credit (given at end of 8th Sem.) 3.

252. **Thesis or Research.** Special topics for investigation for major or minor graduate work. ASSISTANT PROFESSOR THURSTON, CHIEF ERWIN.

Hours by appointment.

### TRUCK CROPS AND MARKET GARDENING

301. **Handling Truck Crops.** Systematic olericulture; harvesting, grading, marketing, and storage of potatoes, cabbage, and other important vegetable field crops.

7th Sem. Prerequisite (or required with this study) 333; lecture and lab. 1, 2 hr.; credit 1.

303 **Truck Crops Practice.** Practical work in truck crops and market gardening supplementing 2.

4th Sem. Prerequisite (or required with this study) 2; lab. 1, 2 hr.; credit ⅔.

304. **Market Gardening.** Intensive commercial vegetable gardening including forcing in frames and greenhouses; harvesting and marketing market garden crops.

8th Sem. Prerequisite 234; lecture and lab. 1, 2 hr.; credit 1.

305. **Truck Farm Management.** Advanced problems in the location, development, and maintenance of truck farms and market gardens; soil management; harvesting, storage, transportation, marketing.

8th Sem. Prerequisite 333; lecture 1; credit 1.

306. **Fruit and Vegetable Products.** Principles and technique of the manufacture of fruit and vegetable products, including fruit juices, syrups, and vinegars; canning; evaporating.

5th Sem. Lecture and lab. 1, 2 hr.; lab. 2 hr.; credit 1⅔; fee $1.00.

333. **Truck Farming.** Growing and marketing of the more important vegetable field crops, such as the potato, cabbage, onion, and tomato.

5th Sem. Recitations 2; credit 2.

342. **Special Problems.** Special investigation under the supervision of some member of the department staff.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1; (b) credit 2.

343. **Thesis.** A special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 342.

7th or 8th Sem. 6 hrs. work per week; credit 2.

344. **Thesis.** A special subject requiring some independent investigation; results to be presented in written report. May be a continuation of 342.

7th and 8th Sem. Recitation 1 each semester with 5 hrs. additional weekly in 8th semester; credit (given at end of 8th Sem.) 3.

352. **Thesis or Research.** Special topics for investigation for major or minor graduate work. ASSISTANT PROFESSOR THURSTON, CHIEF ERWIN.

Hours by appointment.

## LANDSCAPE ARCHITECTURE

Landscape Architecture includes the design, construction, planting and maintenance of farmsteads, estates and other home grounds; also parks, cemeteries, school grounds, sub-divisions and other city planning problems.

The most important function of landscape architecture is the adaptation of land to human service, whether in the city or in the broader natural scenery of the country. Its relation to the location of buildings and the treatment of their surroundings requires a consideration of architectural features. Its materials are mainly included within the fields of Horticulture, Forestry, Geology, and Civil Engineering, to which it bears much the same relation that architecture does to Structural Engineering and other similar technical subjects.

There is now a large opportunity for professional experts, both in private practice and in public employ as landscape architects, city planners, municipal landscape superintendents, called by some city foresters, park superintendents and assistants in the office of landscape firms.

### LANDSCAPE ARCHITECTURE

Leading to the degree of Bachelor of Science in Landscape Architecture.

For the Freshman year, see page 200 or 229. Whenever possible a student should enter through the Forestry Freshman year.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| L. A. 1: Seminar | R | L. A. 2: Seminar | R |
| L. A. 3: Theory and Principles of Landscape Design | 2 | L. A. 5: Elements of Landscape Design | 2 |
| Choice: Hort. 3: General Horticulture (2⅔) | 2⅔ | L. A. 31: Plant Materials | 3 |
| Choice: *English 18: Narration and Description (3) | or 3 | Arch. E. 429: Freehand Drawing | ⅔ |
| Chem. 351: Applied Organic | 3⅓ | Bot. 470: Systematic Spermatophytes | 2⅔ |
| C. E. 181: Drawing | 2 | C. E. 486: Surveying | 3 |
| C. E. 304: Surveying | 3 | Hort. 209: Garden Flowers | 2⅔ |
| Mil. Sci. 3: Military Art | 1 | Choice: Agr'l Ed. 2: Principles of Education (2) | 2 |
| Choice: Phys. 205: Mechanics, Heat and Light (3) | 3 | Choice: *Engl. 19: Exposition (3) | or 3 |
| Choice: Bot. 268: Vegetable Physiology (3⅓) | or 3⅓ | Choice: Pub. Sp. 10: Extempore Speech (2) | 3 |
| Phys. Tr. 3: | R | Mil. Sci. 4: Military Art | 1 |
| Pub. Sp. 2: Fundamentals | 1 | Phys. Tr. 4: | R |
| | 18⅓-19 | | 17 or 18 |

* Required if not previously taken in the Freshman Forestry Course.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| L. A. 4: History of Landscape Design | 2 | L. A. 7: Landscape Design | 3 |
| L. A. 6: Landscape Design | 3 | L. A. 9: Inspection Tour | R |
| L. A. 32: Plant Materials | 2 | †L. A. 33: Planting Design | 1 |
| Arch. E. 304: Elements of Architecture | 3 | L. A. 36: Shade and Street Tree Management | 2⅓ |
| Arch. E. 506: History of Architecture | 2 | Arch. E. 436: Design and Theory of Architecture | 3 |
| †Bot. 308: Plant Pathology of Horticultural Plants | 2⅔ | †Arch. E. 625: History of Architecture | 2 |
| †Mil. Sci. 9: Military Art | 1 | †Mil. Sci. 10: Military Art | 1 |
| Soils 141: Soil Physics | 3⅓ | Soils 342: Soil Fertility | 3⅓ |
| | | Zool. 304: General Entomology | 3⅓ |
| | 19[5] | | 19[5] |

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Agriculture.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits |
|---|---|
| L. A. 21: City Planning | 2 |
| L. A. 22: Civic Design | 3 |
| L. A. 24: Inspection Tour | R |
| L. A. 35: Landscape Practice | ⅔ |
| †Agrl. Eng. 19: Rural Sanitary Equipment | 1 |
| †Agrl. Jour. 8: Beginning Technical Journalism | 2 |
| Arch. E. 518: Freehand Drawing | 2 |
| C. E. 712: Roads and Pavements | 2 |
| Geol. 16: Agricultural Geology | 2⅔ |
| †Hort. 234: Greenhouse Management | 2⅔ |
| Mil. Sci. 11: Military Art | 1 |
| | 19⅚ |

| Eighth Semester | Credits |
|---|---|
| L. A. 8: Construction and Maintenance | 3 |
| L. A. 23: Civic Design | 3 |
| L. A. 34: Planting Design | 1 |
| L. A. 46 or 47: Thesis | 2 or 3 |
| †Agrl. Jour. 9: Technical Journalism Practice | 2 |
| †Arch. E. 622: Freehand Drawing | 2 |
| Forestry 41: Municipal Forestry | 1 |
| †Hort 235: Greenhouse Management | 1 |
| †Mil Sci 12. Military Art | 1 |
| Electives | 3 or 2 |
| | 19⅚ |

## Description of Studies

| Groups | Undergraduate | Undergraduate Graduate | Graduate |
|---|---|---|---|
| Landscape Architecture | 1, 2, 3, 4, 5, 6, 7, 8, 9, 21, 22, 23, 24, 31, 32, 33, 34, 35, 36, 41, 42, 43, 44, 45, 46, 47 | 3, 4, 21, 31, 32, 36 | 48 |

LANDSCAPE ARCHITECTURE

1. **Seminar.** The field of landscape architecture, its scope, its methods, and its materials. Different types of problems; literature; the collection of published data of value to the practicing landscape architect; office organization.

3rd Sem. 1 hr

2. **Seminar.** A continuation of 1.

4th Sem 1 hr.

3 **Theory and Principles of Landscape Design.** (Hort. 407.) The theory and laws of composition and their application to landscape architecture. The requirements of the home grounds, estates, parks, cemeteries, etc. The development of the styles of landscape architecture.

3rd or 4th Sem Lectures 2, credit 2

† May be omitted by students appointed to the Reserve Officers' Training Corps For full information, see page 270.

4 **History of Landscape Design.** (Hort. 411.) The development of the art through the national periods with special reference to Italian, French, English and American gardens. The several styles analyzed and their chief characteristics studied in reference to the modern art. Lectures, readings, abstracts and reports.

5th Sem. Lectures 2; credit 2.

5. **Elements of Landscape Design.** (Hort. 419.) The simpler compositions; tracing good examples of small home grounds and gardens for portfolio; types of drafting and presentation in office practice; paced surveys, mapping and grading operations.

4th Sem. Prerequisites 3 with 31, C. E. 304; lab. 2, 3 hr, credit 2; fee $1.00.

6. **Landscape Design.** (Hort. 420.) Practice in design; home grounds, suburban properties and related problems; solution of original problems based on topographical surveys. Field work, drafting, criticisms.

5th Sem. Prerequisites 5 with 32, C. E. 486; lab. 3, 3 hr.; credit 3; fee $1.00.

7. **Landscape Design.** (Hort. 421.) A continuation of 6. Special problems dealing with farmsteads and country estates. Field work, drafting, criticism.

6th Sem. Prerequisite 6, lab. 3, 3 hr; credit 3; fee $1.00.

8. **Construction and Maintenance.** (Hort. 417.) Methods of construction, carrying out of plans in organization, reporting, accounting, estimating; maintenance work in parks, on estates, its organization, management and cost. Lectures, readings, reports.

8th Sem. Prerequisite 22, lectures 2, rec 1; credit 3.

9. **Inspection Tour.** This tour is planned to give the junior students in design a chance to study some of the best examples of landscape work in the Middle West. These examples will include finished compositions and work under construction. This tour will cover a week to ten days.

6th Sem.

21. **City Planning.** (Hort. 414.) With special reference to the fundamental consideration on which the functional planning of a city is based; composition of the city plan; elements of city plan, including street plan, blocks and lots, open areas such as parks, playgrounds, boulevards, civic centers; architectural decoration and vegetation in the city; regulations and nuisances.

7th Sem Recitations 2, credit 2

22. **Civic Design.** (Hort. 423). Designing of parks, playgrounds, school grounds, cemeteries, church yards and other public and semi-public areas in rural and town communities. Field work, criticism.

7th Sem. Prerequisite 7 with 21; lab. 3, 3 hr.; credit 3; fee $1.00.

23. **Civic Design.** (Hort. 424.) Continuation of 22. Designing of residential districts, civic centers; study of the larger units of city planning.

8th Sem. Prerequisite 22; lab 3, 3 hr; credit 3; fee $1 00

24. **Inspection Tour.** This will be taken in the fall and will include the study of problems in advanced design and in city planning. Detailed

surveys and studies will be made of finished work and that under construction. This tour will cover a week to ten days.

7th Sem.

31. **Plant Materials.** (Hort. 409.) Trees, shrubs, vines and herbaceous plants important to landscape architecture; landscape value; adaptability to Iowa conditions; use in design. Lectures, readings and field trips.

4th Sem. Lectures 2; lab. 1, 3 hr.; credit 3.

32. **Plant Materials.** (Hort. 410.) A continuation of 31.

5th Sem. Lecture 1; lab. 1, 3 hr.; credit 2.

33. **Planting Design.** (Hort. 422.) Planting plans for the problems done in 6; drafting, criticisms and field work.

6th Sem. Prerequisite, or required with this study, 7; lab. 1, 3 hr.; credit 1.

34. **Planting Design.** (Hort. 425.) Planting plans for the problems completed in 22; drafting, criticism and field work.

8th Sem. Prerequisite, or required with this study, 24; lab. 1, 3 hr.; credit 1.

35. **Landscape Practice.** (Hort. 403.) Practical field work in carrying out plans, construction and maintenance.

7th Sem. Lab. 1, 2 hr.; credit ⅔.

36. **Shade and Street Tree Management.** (Hort. 418.) Adaptation and selection of trees for street and park use; mechanical injuries, tree surgery; transplanting large specimens; injuries from electrolysis and from illuminating gas; soil preparation. Lectures, reports.

6th Sem. Prerequisites, Bot. 268 or 269, Chem. 351; lecture 1; lab. 2, 2 hr.; credit 2⅓; fee $2.00.

41. **Rural Improvement.** (Hort. 408.) Application of landscape principles to the elements of the rural community with special reference to the farmstead, emphasizing the grouping of the buildings and the arrangement of the home grounds for utility and beauty; the improvement of rural highways, cemeteries and school grounds; a study of a select list of native and hardy trees and shrubs to be used in Iowa plantings. Lectures, readings, reports and field trips.

3rd or 4th Sem. Lectures 2; credit 2.

42. **Home Gardening.** (Hort. 430.) Arrangement of home grounds, lawns, drives, ornamental trees and shrubs, vegetable, fruit and flower gardens. Especially for Home Economic students.

2nd Sem. Lectures 2; lab. 1, 2 hr.; credit 2⅔.

43. **Rural Landscape Design.** (Hort. 431.) Preparation of plans for farmsteads and other home grounds, parks, railway stations, school grounds, and other public and semi-public grounds. For Agricultural Engineering students.

8th Sem. Prerequisite 41; lab. 1; credit ⅔.

44. **General Landscape Design.** (Hort. 432.) Planning the home grounds, farmsteads, school grounds, small parks, playgrounds; other private and public problems. Primarily to meet the needs of the amateur or layman; very flexible. Open to all students as elective.

7th Sem. Prerequisite 3 or 41; lab. 2, 3 hr. ;credit 2; fee $1.00.

45. **Special Problems.** (Hort. 442.) Special investigation under the supervision of some member of the department staff.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1; (b) credit 2.

46. **Thesis.** (Hort. 443.) Requiring independent investigation; results to be presented in written report. May be a continuation of 45.

6th or 7th Sem. Recitations 1 or 2; (a) credit 1; (b) credit 2.

47. **Thesis.** (Hort. 444.) Independent investigation; results to be presented in written report. May be a continuation of 45.

7th and 8th Sem. Recitation 1 each semester with 5 hrs. additional weekly in 8th semester; credit (given at end of 8th Sem) 3.

48. **Thesis.** (Hort. 452.) Special topics for investigation for minor graduate work. ASSOCIATE PROFESSOR CULLEY

Hours by appointment.

## INDUSTRIAL SCIENCE

DEAN BUCHANAN, Science Building, Room 101

*For general information concerning the Division, see page 76.*

The Division of Industrial Science offers the following outlined courses:

**Four Year Courses:**

1. **Industrial Science,** with opportunity for doing major work in Bacteriology and Hygiene, Beekeeping (Apiculture), Botany, Chemistry, Economics, Geology, Mathematics, Military Science and Tactics, Physics, Veterinary Anatomy, Veterinary Pathology, Veterinary Physiology or Zoology.....p. 246

Special groups in Industrial Science:

a. Agricultural Economics..p. 170
b. Applied Geology .....p. 210
c. Applied Entomology ....p. 314
d. Applied Chemistry .....p. 144
e. Plant Pathology .....p. 124
f. Rural Sociology .....p. 171

2. **Chemical Engineering** (under the joint jurisdiction of Engineering and Industrial Science).....p. 138

**Five-Year Combined Courses:**

1. **Industrial Science and Agriculture:** Agricultural Education, Agronomy, Animal Husbandry, Dairying, Forestry, and Horticulture .....p. 248

2. **Industrial Science and Engineering:** Agricultural Engineering, Architectural Engineering, Ceramics, Civil Engineering, Electrical Engineering, Mechanical Engineering, and Mining Engineering .....p. 248

3. **Industrial Science and Home Economics:** Home Economics .....p. 248

The courses in Industrial Science are not "liberal arts" courses. They are courses intended to fit the student for certain specialized fields of professional activity, particularly such as require for their best development the accessibility of the technical departments of the Divisions of Agriculture, Engineering, Home Economics, and Veterinary Medicine.

An opportunity is afforded for the election of an amount of general work approximately equal to that allowed or required in other technical courses of the institution. At the same time, it must be remembered that scientific and technical studies are to be regarded as having a real cultural value quite as truly as do the so-called humanities Neither are these courses to be regarded as *general* science courses, for as soon as the scientific and linguistic foundation of the Freshman and a part of the Sophomore years has been secured, the student is required to specialize in some science, and to relate it definitely to its industrial and professional phases. Opportunity is given, upon approval of the head of the department in which the student is taking his work and the dean of the division, to elect a limited amount of work taught by departments in other divisions of the College, such work to serve as supporting subjects to his major work. In the discussions under the various scientific departmental headings will be found lists of subjects in which the student is invited to specialize, likewise statements as to the opportunities open to graduates in these various fields.

## Course in Industrial Science

Leading to the degree of Bachelor of Science (in some major science).

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Botany, Chemistry or Zoology, Elementary | 4-5 | Botany, Chemistry or Zoology | 3-5 |
| Engl. 18[1]: Narration and Description, or | | Engl 19 Exposition, or | |
| Engl 220· Exposition | 3 | Engl. 221· Narration and Description | 3 |
| H. Ec. 41: Personal Hygiene (for women) or | | Hist 20 or 24· Industrial History of the United States or Economic History of American Agriculture | 2 |
| Mil. Sci. 1· Military Art (for men) | 1 | Math 42b and 43. Plane Trigonometry and Plane Analytic Geometry | 5 |
| Math. 40 and 41: College Algebra and Plane Trigonometry | 5 | Mil Sci 2 Military Art | 1 |
| Modern Language German | 3-5 | Modern Language German | 3-5 |
| Phys. Tr. 1: (for men) or | | | |

[1] The number refers to the description of the study
[2] For definition of a credit see page 81
[3] R indicates that the study is required, without credit, for graduation

| | | | |
|---|---|---|---|
| Phys. Cult. 1: (for women) | R[3] | Phys. Tr. 2 (for men) or | |
| Ind. Sci. 1: Technical Lecture | R | Phys. Cult. (for women) | R |
| Electives | 1-0 | | |
| | 17-18 | | 17-18 |

NOTE: Freshmen who show deficient preparation in Mathematics may be assigned by the Dean of the Junior College and the Dean of Industrial Science to special classes, with one more hour of work than indicated above; and in case of clear indication of failure, even with this arrangement, they will be dropped from their freshman work in these subjects until they have given proof of sufficient preparation to enable them to carry the work successfully.

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| *Industrial Science Electives | 8 | *Industrial Science Electives | 8 |
| **Modern Language: German | 3 | **Modern Language: German | 3 |
| Mil. Sci 3: Military Art (for men) | 1 | Engl. 412 or 413: Argumentation or Advanced Composition | 2 |
| Phys. Cul. 3, 5, or 7 (for women) or | | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr 3: Phys Training (for men) | R | Phys. Cul. 4, 6, or 8, or | |
| Electives | 5-6 | Phys. Tr. 4: Phys. Training | R |
| | | Electives | 3-4 |
| | 17 | | 17 |

* To be chosen from studies offered in Industrial Science Departments: Bacteriology and Hygiene, Botany, Chemistry, Economics, Entomology, Geology, Mathematics, Military Science and Tactics, Physics, Veterinary Anatomy, Veterinary Pathology, Veterinary Physiology, and Zoology

** Students who have completed Mod. Lang. 17 or 21 or equivalent may drop Modern Language and take electives in its place.

JUNIOR AND SENIOR YEARS

*Before classification* the student must choose a major science subject and outline his complete course of study for the Junior and Senior years.

A major subject shall be chosen from the following list: Agricultural Economics, Bacteriology and Hygiene (p 118), Bee-keeping (Apiculture) (p 314), Botany (p. 123), Chemistry (p. 143), Economics (p. 169), Entomology (p 314), Geology (p. 210), Mathematics (p 253), Military Science and Tactics (p. 268), Physics (p. 292), Plant Pathology (p. 124), Rural Sociology (p. 171), Veterinary Anatomy (p. 301), Veterinary Pathology (p 303), Veterinary Physiology (p. 306), Zoology (p. 313). For details concerning the departmental requirements for major work the student should consult catalogue statements of the department chosen. He should then outline his course of study, guided by the following rules:

1. A minimum of sixteen hours, maximum of eighteen hours, shall be taken during each semester, or a total minimum of 64 hours for the Junior and Senior years.

2. The complete course of study for the Junior and Senior years shall be outlined in consultation with the head of the department concerned.

Such outline shall bear the signature of approval of the head of such department, and shall be filed with the Dean of the Division of Industrial Science. A copy shall also be filed with the Registrar.

3. The course of study as outlined under 2 shall not be amended or changed, except by approval of the head of the department; and any such changes shall be in writing, shall bear the signature of approval of the department head, and shall be filed with the original course of study.

4. This outline may be filed at any time during the Sophomore year.

5. A total of at least twenty hours shall be chosen from the department in which the major work is taken.

6. At least twenty-four hours in addition to the major shall be chosen from studies offered in science and industrial departments. These studies shall be those requisite to the proper development of the major work.

7. Not more than twenty-four hours may be taken in any division of the College other than the Division of Industrial Science.

8. Studies duplicating in whole or in part studies already taken, will, when elected, entitle students to credit only in study for which the greater credit is given.

9. Members of Advanced Course R. O. T. C. will receive 2 credits per semester under paragraph 6 above for this work.

## Courses in Industrial Science and Agriculture, or Engineering, or Home Economics (five years)

Students enrolled in the course in Industrial Science who have completed the work of the Junior year and who have credits in certain subjects as noted below, may classify as Junior students in any course in Agriculture, Engineering, or Home Economics, and graduate from both courses and receive both degrees at the end of two years or upon the completion of seventy-two hours of additional work, or in special cases upon the completion of such greater or less number of credits as the Committee on Advanced Credits shall recommend.

The following requirements must be met by students taking advantage of the combined five-year courses:

1. Students will be required to complete all the technical subjects required by the technical department in which they classify.

2. All prerequisites for technical subjects must be met.

3. For classification in the divisions and courses given below, the following credits must be presented:

**A. Division of Agriculture:**

(1) For courses in animal husbandry and dairying: Chemistry, sixteen credits; botany, four credits; physics, three credits; zoology, eight credits; and other science credits to make a total of forty credits.

(2) For courses in agronomy, horticulture, forestry, and agricultural education: Chemistry, sixteen credits; botany, eight credits; physics, three credits; zoology, four credits; and other science credits to make up a total of forty credits.

**B. Division of Engineering:**

In all courses: Mathematics, twenty credits, of which six must be in calculus; physics, ten credits; chemistry, eight credits; and other science credits to make a total of forty credits.

Four credits in mechanical drawing must be presented, of which two may be in descriptive geometry.

Students electing mining engineering, ceramics, or chemical engineering, should offer, if possible, additional credits in chemistry.

Students electing agricultural engineering should offer, if possible, additional credits in agriculture.

**C. Division of Home Economics:**

In all courses: The student must present in Chemistry, sixteen credits; botany, six credits; physics, six credits; zoology, eight credits; and other science credits to make a total of forty credits.

### Course in Industrial Science and Veterinary Medicine (six years)

Leading to the Degree of Bachelor of Science and the Degree of Doctor of Veterinary Medicine.

The following course is designed to meet the need of those students who wish to secure a thorough foundation in the biological and chemical sciences preliminary to the studying of veterinary medicine. The degree of Bachelor of Science is granted at the end of the fourth year, and the degree of Doctor of Veterinary Medicine upon the completion of the sixth year. The increased time at the disposal of the student gives an opportunity to prepare himself efficiently for investigational work.

At the present time the better colleges granting degrees in human medicine require two years of collegiate preparation. Veterinary Medicine is quite as exacting in its requirements of students, particularly those who wish to go into governmental or research work. The opportunities open to students well grounded both in science and in veterinary medicine are excellent. Many positions in the Bureau of Animal Industry of the Department of Agriculture, in the experiment stations of our land grant colleges, and in the teaching staffs of our various veterinary schools and agricultural colleges, are opened every year. It has been in the past practically impossible to secure men with the right training. This course is designed to train men for such positions.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. 103[1]: General Chemistry | 4 | Chem. 104: General Chemistry | 4 |
| Engl. 18: Narration and Description | 3 | Engl. 19: Exposition | 3 |
| Mil. Sci. 1: Military Art | 1 | Hist. 20: Industrial History of the United States | 2 |
| Modern Language: German | 3-5 | Mil. Sci. 2: Military Art | 1 |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.

| | | | |
|---|---|---|---|
| Phys. Tr. 1 | R | Modern Language: German | 3-5 |
| Vet. Anat. 101: Osteology and Arthrology | 4 | Phys. Tr 2 | R |
| Electives | 2-0 | Vet Anat. 202: Myology and Splanchology | 5 |
| | 17 | | 18 |

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Chem. 351: Applied Organic Chemistry | 3⅔ | Chem. 352: Agricultural Analysis | 3⅓ |
| Math. 17: Algebra and Trigonometry | 3 | Mil. Sci. 4: Military Art | 1 |
| Mil. Sci. 3: Military Art | 1 | Mod. Lang.: German | 3 |
| Modern Language: German | 3 | Phys Tr. 4 Phys. Training | R |
| Phys. Tr. 3: Phys Training | R | Phys 406: General Physics | 3 |
| Vet. Anat. 133: Microscopy and Microscopic Anatomy | 3 | Vet. Anat. 234: Microscopic Anatomy of the Organs | 3 |
| Zool. 2: General Zoology | 5 | Zool 3 General Zoology | 5 |
| | 18⅔ | | 18⅓ |

THIRD AND FOURTH YEARS

The student will classify with the Dean of Veterinary Medicine as a senior college student in Industrial Science and Veterinary Medicine. In the semester in which he completes the requirements for the bachelor's degree, he shall also register with the Dean of Industrial Science He shall outline his course of study, guided by the following rules:

1. A minimum of 18 hours per semester shall be carried.
2. All subjects of the freshman and sophomore years of the four year course in veterinary medicine not already taken shall be completed (excepting Chemistry 111 and 408 and Zoology 15)
3. English 412 or English 413 and at least ten hours of free electives, i. e., subjects not required of students pursuing the four year curriculum in Veterinary Medicine, shall be completed

The Degree of Bachelor of Science will be conferred upon fulfillment of the preceding requirements.

FIFTH AND SIXTH YEARS

The student will classify with the Dean of Veterinary Medicine as a senior college student in Veterinary Medicine. He shall outline his course in conformity with the following requirements:

1. A minimum of 18 hours per semester shall be carried.
2. All subjects of the Junior and Senior years of the four-year curriculum in Veterinary Medicine shall be completed.

3. Free electives shall be chosen to fill the number of credit hours to the required 18.

The degree of Doctor of Veterinary Medicine will be conferred upon the fulfillment of the preceding requirements.

## INDUSTRIAL SCIENCE

### Description of Studies

| Groups | Undergraduate |
|---|---|
| General | 1 |

1. **Technical Lecture.** Four lectures by the college librarian on books and the use of the library, followed by weekly lectures on various phases of work in Industrial Science. Vocational guidance.

1st Sem. Lecture 1: required.

## LANDSCAPE ARCHITECTURE

(Sub-department of Horticulture and Forestry.)

For description of studies, see page 242.

## LIBRARY

LIBRARIAN .... .. ...., Central Building, Room 111

Assistant Librarian Dixon; Reference Librarian Winslow; Cataloguers Pritchett, Bolton; Readers Department Rush; Serial Department French; Assistants Aldrich, Baily, Van Auken, Rae, Rees, Semmons, Smith, Walworth

*For information concerning the Division of Industrial Science, see page 76.*

The College library consists of about 62,000 volumes devoted mainly to Agriculture, Science, and Technology. It is divided into the following groups:

**General Library,** Central Building. This contains the general reference books, encyclopedias, dictionaries, atlases, and the books relating to general science, economics, modern language, literature, and home economics. The library receives about 800 periodicals—technical and general; of many of these there are complete files upon the shelves.

The reading room of the library is open to readers twelve and one-half hours daily, except Sunday, when it is open three hours. Current numbers of periodicals are kept in the reading room and are accessible to all, as are newspapers, college exchanges, the card catalogue, and other reference tools.

**History Seminar Library,** Central Building. This collection is particularly strong in economic history.

**Psychology Office Library,** Central Building. In this room are shelved standard works on psychology and the leading psychological magazines.

**Agricultural Library,** Agricultural Hall. In this collection are 10,000 volumes devoted to agriculture and allied subjects. It contains the publications of the U. S. Department of Agriculture, many foreign state reports, complete sets of state experiment station reports, complete files of many agricultural journals, a large collection of reports on agricultural subjects by technical and learned societies, and complete sets of herd books, both English and American. It receives currently fifty agricultural journals. The collection of books relating to Animal Husbandry is especially good.

**Botany Library,** Central Building. This library consists of 2,000 books, 500 pamphlets, and about fifty current periodicals. In the collection there are many bound periodicals in French and German. The library contains a set of the publications of the U. S. Department of Agriculture and the various state experiment stations. An effort is being made to build up the library along the lines of economic botany.

**Chemistry Library,** Chemistry Building. This is a good working collection of 3,000 books relating to chemistry and its branches. Thirty journals are received currently and back files are bound for reference.

**Engineering Library,** Engineering Hall. This library was established in 1906. It contains 8,000 volumes and receives currently about 125 technical periodicals, back files of many of which are preserved for reference. In 1906 the College received by bequest 1500 volumes pertaining to engineering and economics from the library of the late George W. Catt; this forms the nucleus of a very good working library on engineering and its branches.

**Two-Year Reading Room, Chemistry Building.** This room contains a small collection of books primarily for the use of the two-year students of the college.

**Veterinary Library,** Veterinary Building. This collection consists of 2600 volumes, and 100 technical journals and farm papers. The book collection includes works on zoology, bacteriology, medicine, veterinary surgery, veterinary anatomy, veterinary physiology, and veterinary pathology. About one-fourth of the current periodicals are French and German. This is one of the best collections of books on veterinary medicine in the country.

**Description of Studies**

| Groups | Undergraduate |
|---|---|
| Library Instruction | 1, 2, 3, 4, 5 |

1. **Agricultural Library Instruction.** The use of the library, arrangement and classification of the books, the making of a bibliography, and a survey of agricultural literature.

1st Sem. Lectures 4; required.

2. **Home Economics Library Instruction.** Same as 1 except that a survey of home economics literature is given.

1st Sem. Lectures 4; required.

3. **Engineering Library Instruction.** Three of the Technical Lectures for Engineering students are devoted to classification, arrangement, and use of the Engineering library.

See Agr'l Engr. 25, Arch. E. 202, Chem. E. 601, C. E. 242, E. E. 101, M. E. 117, R.S.D. 200.

4. **Industrial Science Library Instruction.** Four of the Technical Lectures for Industrial Science students are devoted to the use of the library, the making of a scientific bibliography, the use of statistics, scientific indexes, and a survey of scientific literature.

1st Sem. Lectures 4; required.

5. **Veterinary Library Instruction.** Same as 1 except that a survey of veterinary literature is given.

2nd Sem. Lectures 4; required.

## MATHEMATICS

PROFESSOR STANTON, Central Building, Room 218

Professor Roberts; Associate Professors Colpitts, Pattengill, Chaney, Snedecor; Assistant Professors Fleming and Tappan; Instructors Smith, McKim, Daniells, Sage, Farnum, Harmsen.

*For information concerning the Division of Industrial Science, see page 76.*

The work of the Department of Mathematics is directed to the following ends:

1. The development of intellectual strength.
2. Accuracy in presentation of mathematical truths.
3. The acquiring of such command of the subject matter of Mathematics as will make it a valuable instrument in higher scientific and technical study.
4. The specialized application of mathematics to industry and industrial education.

The Department of Mathematics occupies fourteen rooms on the second floor of Central Building. Its class rooms are large and well supplied with blackboards. A good case of models is of material assistance in the presentation of some phases of its work. Its library, consisting of over eight hundred volumes, is well selected, and mainly on pure mathematics. Additions in applied mathematical subjects, in which it is now developing new work, are being made continually.

### Course in Industrial Science—Major Mathematics

For Freshman and Sophomore years see page 246.

For general directions concerning work of Junior and Senior years, see page 247.

The student who expects to pursue major work in mathematics should elect in the Sophomore year Math. 44 and 45, and in the Junior and Senior years from fifteen to twenty hours of advanced work in mathematics which shall include Math. 49, 51, 53, 54, and 58.

In addition to the work in mathematics, the student should elect at least one year of work in Physics and obtain a reading knowledge of French or German.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Mathematics | 4[1], 6, 17, 19, 30, 32, 40, 41, 42a, 42b, 43, 44, 45, 46 | 48, 49, 50, 51, 53, 54, 58, 59, 63, 64, 72, 73, 75, 79 | 55, 82 |

The following studies in this department have been omitted from the Catalogue for the period of the war: 69, 70, 77

4. **College Algebra.** A four weeks' review up to and including quadratic equations; followed by ratio, proportion, variation, the progressions, binomial theorem, convergency and divergency of series, theorem of undetermined coefficients including partial fractions, principles and use of logarithms, and the theory of equations. Designed primarily for home economics students, it embodies, in the examples, computations which the student has occasion to use throughout the course, and the use of the graph, an efficient tool in the expression of the results of scientific observation.

1st Sem. Prerequisite, entrance algebra and plane geometry; recitations 5; credit 5.

6. **Solid Geometry.** Properties of planes, of diedral and polyedral angles, prisms, pyramids, cylinders, cones, and spheres; spherical triangles and spherical polygons

2nd Sem. Prerequisite, entrance plane geometry; recitations 2; credit 2

17. **Algebra and Trigonometry.** Definitions; positive and negative angles; circular measures of angles; operations upon angles; functions of angles, their relations and varying values; determination of values of the functions of particular angles; functions of different angles expressed in terms of those of a basal angle; derivation and reduction of trigonometric formulas; use of logarithms, solution of right and oblique triangles, with practical application.

1st or 2nd Sem Prerequisite, entrance algebra, recitations 3, credit 3.

19. **College Algebra.** For students who, after trial, show lack of preparation sufficient to enable them to carry 40. An additional hour enables these students to review thoroughly the elementary algebraic processes, and at the same time complete the regular college algebra.

1st Sem. Recitations 6; credit 5.

30. **Plane Trigonometry.** Same as 17, except that since the students taking this course have had considerable previous work in logarithms, more time is devoted to identities and the solution of trigonometric equations.

2nd Sem. Prerequisite 4 or 40; recitations 3, credit 3

[1] The number refers to the description of the study.

32. **Plane Analytic Geometry.** Representation of points, lines and curves in a plane; careful study of the graphs of equations, and elementary investigation of the line, the circle, and the conic sections.

4th Sem. Prerequisite 17; recitations 2; credit 2.

40. **College Algebra.** The first four weeks of the semester are devoted to a review of algebra up to and including quadratics. This is followed by variation, the progressions, binomial theorem, partial fractions, principles and use of logarithms, and theory of equations. Students failing in the review will be assigned to such work as they are fitted to pursue.

1st or 2nd Sem. Prerequisite, entrance algebra; recitations 5 (for 12 weeks); credit 3.

41. **Plane Trigonometry.** Definitions; positive and negative angles; circular measure of angles, functions of angles, their relation and varying values; determination of functions of different angles expressed in terms of those of a basal angle; solution of right triangles; trigonometric equations and the proving of identities.

1st or 2nd Sem. Prerequisite 40; recitations 5 (for 6 wks.); credit 2.

42a. **Plane and Spherical Trigonometry.** Derivation of the formulas relating to the sum and difference of two angles; functions of double angles and of half angles with identities and equations based upon these formulas, and the solution of oblique triangles; the elements of spherical trigonometry.

1st or 2nd Sem. Prerequisite 41; recitations 5 (for 5 wks.); credit 1.

42b. **Plane Trigonometry.** Same as 42a, except spherical trigonometry, which is omitted to give time for more drill on formulas and applications.

1st or 2nd Sem. Prerequisite 41; recitations 5 (for 5 wks.); credit 1.

43. **Plane Analytic Geometry.** Representation of points, lines, and curves in a plane; careful study of the graphs of equations, and investigation of the line, the circle, and the conic sections.

2nd or 3rd Sem. Prerequisite 30 or 42; recitations 5 (for 13 wks.); credit 4.

44. **Calculus.** Differentiation and integration, with problems showing relation of calculus to physics and mechanics.

3rd or 4th Sem. Prerequisite 43; recitations 5; credit 5.

45. **Calculus.** Differential calculus: expansion of functions, indeterminate forms, asymptotes, direction of curvature, points of inflexion, radius of curvature, envelopes, and maxima and minima. Integral calculus: applications to determining areas, lengths of curves, surfaces of revolution, volumes of solids of revolution and other solids, applications of double integration to areas, surfaces, centers of gravity. Elements of differential equations.

4th or 5th Sem. Prerequisite 44; recitations 5; credit 5.

46. **Mathematics of Electrical Engineering.** A discussion of the number system, the significance of operators, the fundamental operations of complex numbers and series, with special applications to electrical engineering.

5th Sem. Prerequisite 45; recitations 2; credit 2.

48. **Theory of Equations.** Includes limits of roots, location of roots, multiple roots, Sturm's Theorem, and solution of higher equations.

6th or 8th Sem. Recitations 3; credit 3. (Not offered fall 1918.)

NOTE: Mathematics 48 or any subject following 48, although taught regularly but once in two years, will be given at any time when there is sufficient demand to justify the formation of a class.

49. **Determinants and Advanced Analytical Geometry.** The evaluation of determinants, solution of equations by determinants, the general equation of second degree, higher plane curves and analytical geometry of three dimensions.

5th or 7th Sem. Recitations 3 or 4; credit 3 or 4.

50. **Spherical Trigonometry.** Formulas relating to the right triangle. Napier's rules, solution of right triangles; spherical triangles in general; solution of examples, with applications of both right and oblique triangles to the celestial sphere.

5th or 7th Sem. Recitations 2; credit 2. (Not offered spring 1919.)

51. **History of Mathematics.** The development of mathematics, together with brief histories of the leading mathematicians. Present day problems, including subjects to be emphasized and methods of teaching. The reciprocal influence upon each other of mathematics and the industries.

6th or 8th Sem. Lectures and recitations 2; credit 2.

53. **Advanced Differential Calculus.** Can be taken in one semester or divided into two parts: (a) Tangents, normals, asymptotes, direction of curvature, points of inflexion, maxima and minima, order of contact, osculating circle, singular points, the application of differential calculus to curve tracing. (b) Infinite series, including summation of series, convergency and divergency of series, logarithmic series, trigonometric series, Maclaurin's and Taylor's series, with various applications.

5th, 6th, 7th, or 8th Sem. Recitations 2 or 4; credit 2 or 4.

54. **Advanced Integral Calculus.** Can be taken in one semester or divided into two parts: (a) Applications of integral calculus to functions of a complex variable, definite integrals, double integration and integration in series. (b) Elliptic integrals. A development of the theory of integration leading up to elliptic integrals; the elements of elliptic functions; applications to problems in geometry and mechanics.

6th or 8th Sem. Recitations 2 to 5; credit (a) 3, (b) 2.

55. **The Theory of Functions of the Complex Variable.** Introductory. Complex numbers and their geometrical representations; conformal representation, and analytic functions of a complex variable.

ASSOCIATE PROFESSOR COLPITTS

5th, 6th, 7th, or 8th Sem. Lectures and recitations 3, or throughout the year; credit 3 to 6. (Not offered fall 1918 or spring 1919.)

58. **Differential Equations.** Formation of differential equations; solution of equations of the first order with applications to geometry and physics; the study of the methods of handling linear equations with constant and variable coefficients; exact differential equations; integration in series; equations of the second order with geometrical, mechanical, and

physical applications; ordinary differential equations with more than two variables; partial differential equations of the different orders.

5th or 7th Sem. Recitations 3 to 5; credit 3 to 5.

59. **Projective Geometry.** Notion of a projective line and plane, illustrated by the corresponding Euclidean forms with adjoined ideal elements at infinity and by analytic system of points; homogeneous coördinates, elementary projective forms and their projective relations; principle of duality, harmonic properties of projective forms and their application to the theory of conic sections in the plane.

5th, 6th, 7th, or 8th Sem. Recitations 2 to 5; credit 2 to 5.

63. **Statistical Method of Interpreting Experimental Data.** The applications of mathematics to the interpretation of statistical series, including the development of the formulas for dispersion and correlation. The illustrations are drawn from experiments in the field of both engineering and biology.

6th or 8th Sem. Prerequisite 45; lectures and recitations 2; credit 2.

64. **Introduction to Higher Algebra.** Determinants, theory of linear dependence, properties of matrices, invariant factors, algebraic theory of a single quadratic or bilinear form; theory of pairs of quadratic or bilinear forms.

5th, 6th, 7th, or 8th Sem. Recitations 2 or throughout the year; credit 2 to 4.

72. **Biometic Methods of Interpreting Agricultural Data.** A brief discussion of the statistical method of interpreting biological data, the development of the necessary formulæ, and numerous illustrations of their use in the interpretation of data drawn from experiments in plant and animal nutrition, genetics, and other branches of agriculture and biology.

5th or 7th Sem. Lectures and recitations 2; credit 2.

73. **Theoretical Mechanics.** Of fundamental importance to all students majoring in mathematics or to students of physics or engineering. Force, laws of motion, force acting on a single particle, statics of systems of particles, statics of rigid bodies, center of gravity, work, motion of a particle under constant forces, motions of systems of particles, motion of a particle under a variable force, motion of rigid bodies and generalized coördinates.

5th, 6th, 7th, or 8th Sem. Lectures and recitations 3 or throughout the year; credit 3 to 6.

75. **Vector Analysis as Applied to Physics and Mechanics.** The sum and products of vectors, selected topics from the differential and integral calculus of vectors, with applications in mechanics and various branches of physics.

5th, 6th, 7th, or 8th Sem. Prerequisite 45; lectures and recitations 3 to 5.

79. **Differential Equations of Mathematical Physics.** A critical treatment of the equations of Bessel, Laplace, and Poisson, and of Lagrange's equations of motion, with application to certain boundary value problems of physics. ASSOCIATE PROFESSOR CHANEY

Prerequisite 58; lectures and recitations 3; credit 3.

82. **Introduction to the Mathematical Theory of Electricity and**

**Magnetism.** A treatment of electrostatics and current electricity, magnetostatics and electrodynamics from the mathematical standpoint.

ASSOCIATE PROFESSOR CHANEY

Prerequisites 58, 73; 3 hours for one semester, or 2 hours for the year; credit 3 or 4.

## MECHANICAL ENGINEERING

PROFESSOR MEEKER, Engineering Hall, Room 202

Associate Professors Cleghorn, Major, Norman, Leavell; Assistant Professors Bates, Hummel, Hug, Craig, Olson; Instructors Potter, Spangler, Sawin, Cameron, Nickels, Riedesel

*For information concerning the Division of Engineering, see page 50.*

The Department of Mechanical Engineering is one of the oldest organized departments of the College. Courses of instruction have been given continuously since the opening of the College in 1869.

The work of the department includes the fundamental principles of mechanical drawing and shop work leading up to studies in machine design and construction. The department offers complete courses in the mechanics of engineering of solids and fluids together with class room and laboratory work in the design, operation, and maintenance of power plant machinery and equipment. Work is given in the heating and ventilating of buildings and design of district heating systems.

The course in mechanical engineering is developed around and supported by a good working knowledge of English and the fundamental sciences of Mathematics, Physics, and Chemistry. The course has been arranged to give its graduates the best possible fundamental training, which, when combined with the experience and judgment gained in practical work, will open to them such positions in the profession as consulting engineer, contracting engineer, heating and ventilating engineer, sales engineer, efficiency engineer, works manager, purchasing engineer, machine designer, chief draftsman, foundry superintendent, machine shop superintendent, railway engineer in charge of motive power and rolling stock, superintendent and manager of electric light and power plants, gas works superintendent and engineer, refrigerating engineer, telephone engineer, valuation engineer, patent office expert, mine operator and manager, teacher in trades and engineering schools, and many other positions of equal magnitude and responsibility. The lines of engineering work mentioned above are taken at random from a recent list of graduates in mechanical engineering, who are to be found holding positions of highest engineering responsibility in every branch of the profession as well as positions of public esteem in every state of the Union and in many countries of the world.

The department desires to render all service possible to the mechanical engineering interests of Iowa. To this end correspondence is invited from those interested in the generation of power, heating of buildings, and the operation of shops and manufacturing plants of all kinds. Special investi-

gations will be made, if possible, when the inquiries are of a nature to indicate the need of the technical skill and equipment of the department.

## Course in Mechanical Engineering

Leading to the degree of Bachelor of Science in Mechanical Engineering.

For professional degree, see page 61.

### FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| M. E. 117[1]: Technical Lecture | R[3] | M. E. 218: Technical Lecture | R |
| M. E. 121: Mechanical Drawing | 2 | M. E. 219: Projective Drawing | 3 |
| M. E. 130: Forge Work | 2 | M. E. 232: Foundry Work | 2 |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| Engl. 116: Exposition | 4 | Engl. 117: Narration and Description | 3 |
| Math. 40: College Algebra | 3 | Math. 42b: Plane Trigonometry | 1 |
| Math. 41: Plane Trigonometry | 2 | Math. 43: Plane Analytic Geometry | 4 |
| Mil. Sci. 1: Military Art | 1 | Mil. Sci. 2: Military Art | 1 |
| Phys. Tr. 1 | R | Phys. Tr. 2 | R |
| | 18 | | 18 |

### SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| M. E. 322: Mechanical Drawing | 2 | M. E. 401: Mechanics of Engineering | 3 |
| M. E. 331: Pattern Work | 2 | M. E. 423: Kinematic Drawing | 1 |
| Chem. 155: Quantitative Analysis | 2 | M. E. 437: Advanced Pattern Work | 1 |
| Engl. 412: Argumentation | 2 | M. E. 439: Pipe Fitting | 1 |
| Math. 44: Calculus | 5 | Chem. 156: Quantitative Analysis | 2 |
| Mil. Sci. 3: Military Art | 1 | Math. 45: Calculus | 5 |
| Phys. Tr. 3: | R | Mil. Sci. 4: Military Art | 1 |
| Phys. 303: Mechanics and Heat | 5 | Phys. Tr. 4 | R |
| | | Phys. 404: Electricity, Magnetism, Light and Sound | 5 |
| | 19 | | 19 |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| M. E. 502: Mechanics of Engineering | 5 | M. E. 605: Machine Design | 3 |
| M. E. 503: Materials of Construction | 2 | M. E. 613: Mechanical Lab. | 1 |
| M. E. 512: Mechanical Laboratory | 1 | M. E. 625: Machine Drawing | 1 |
| M. E. 524: Valve Gear Design | 1 | M. E. 642: Seminar | R |
| M. E. 533: Machine Work | 2 | M. E. 660: Hydraulics | 3 |
| E. E. 506: Principles of Electrical Engineering | 4 | M. E. 664: Thermodynamics | 3 |
| Phys. 523: Physics Laboratory | 1 | E. E. 610: Direct Current Machinery | 3 |
| | | Engr. 603: Conservation of Resources | 1 |
| | | Phys. 615: Physical Lab. | 1 |
| Not elective | 16 | Not elective | 16 |
| Engl. 115: Engineering English (2) | 3 | M. E. 634: Machine Work (2) | 3 |
| Mil. Sci. 9: Mil. Art or (1) | or | Mil. Sci. 10: Mil. Art or (1) | or |
| [6]Mil. Sci. 5: Mil. Art (2) | 2 | [6]Mil. Sci 6: Mil. Art (2) | 2 |
| | 19 or 18[5] | | 19 or 18[5] |

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| M. E. 714: Steam and Gas Lab. | 1 | M. E 809: Power Plant Engr. | 3 |
| M. E. 735 Machine Work | 2 | M. E. 811: Thesis | 4 |
| M. E. 743: Seminar | R | M E. 815: Steam and Gas Lab. | 1 |
| M. E. 811: Thesis Subject | R | M. E. 844: Seminar | R |
| E. E. 715 Alternating Current Machinery | 3 | E. E. 818: Laboratory | 1 |
| E. E. 717: Laboratory | 1 | Engr. 801: History of Engr. | 1 |
| Engr. 702: Specifications and Contracts | 1 | Ec Sc. 327: Elementary Accounting | 2 |
| Econ. Sc. 209: Engineering Economics | 3 | | |
| Not Elective | 11 | Not Elective | 12 |
| * A { M E. 704 Steam Engines, Turbines 3; M. E. 707: Heat. & Vent 2; M. E. 726: Heat'g Design 2; Mil. Sci. 11: Mil. Art 1 } | 8 | A { M. E. 808 Railway Mech. Engineering 3; M. E. 827: Crane Design 3; Mil. Sci. 12: Mil. Art 1 } or | 7 |

* Students electing either group in the 7th semester will continue the same group in the 8th semester.

[6] Open only to students appointed to Reserve Officers Training Corps.

| | | | |
|---|---|---|---|
| | or | | |
| B | M. E. 710: Gas Engines and Producers | 3 | |
| | M. E. 707: Heat. & Vent. | 2 | 8 |
| | M. E. 726: Heat'g Design | 2 | |
| | Mil. Sci. 11: Mil. Art | 1 | |
| | or | | |
| C | M. E. 710: Gas Engines and Producers | 3 | |
| | M. E. 791: Gasoline Automobiles | 3 | 8 |
| | M. E. 796: Automobile Lab. | 1 | |
| | Mil. Sci. 11: Mil. Art | 1 | |
| | or | | |
| D[6] | M. E. 704: Steam Eng. Turbines | 3 | |
| | Mil. Sci. 7: Mil. Art | 2 | 8 |
| | Mod. Lang (...): Fr., Ger., or Sp. | 3 | |
| | Group Electives | | 8 |
| | | | 19[5] |

| | | | |
|---|---|---|---|
| B | M. E. 808: Railway Mech. Engineering | 3 | |
| | M. E. 828: Gas Engine Design | 3 | 7 |
| | Mil. Sci. 12: Mil. Art | 1 | |
| | or | | |
| C | M. E. 898: Automobile Motor Design | 3 | |
| | M. E. 892: Automobile Chassis | 2 | 7 |
| | M. E. 897: Automobile Testing | 1 | |
| | Mil. Sci. 12: Mil. Art | 1 | |
| | or | | |
| D[6] | Mil. Sci. 8: Mil. Art | 2 | |
| | Mod. Lang. (...): Fr., Ger., or Sp. | 3 | 5 |
| | Group Electives | 7 or 5 | |
| | | 19 or 17 | |

## Five-Year Course in Mechanical Engineering

(Omitted during the period of the war.)

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Shop Work | 130[1] 140, 141, 148, 218, 232, 245, 250, 331, 437, 439, 533, 634, 735, 776 | | |
| Drawing and Design | 121, 181, 219, 220, 272, 322, 382, 423, 483, 524 | 503, 605, 625, 785, 827, 892, 898 | |
| Mechanics of Engineering Solids and Fluids | 375, 671, 773 | 401, 502, 588, 660 | |
| Steam Engineering | 117 | 664, 704, 707, 726, 777, 808, 809, 889 | 1051 |

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.
[3] R indicates that the study is required, without credit, for graduation.
[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Engineering. See Business Engineering, page 131.
[6] Open only to students appointed to Reserve Officers Training Corps.

| | | |
|---|---|---|
| Gas Engineering | — | 710, 790, 791, 828 |
| Experimental Engineering | | 512, 516, 613, 714, 795, 796, 815, 897 |
| General | 642, 743, 811, 844 | 853 |

117. **Technical Lecture.** Shop materials, methods, tools and appliances. Three lectures of this course are given by college librarian in explanation of catalogue system and use of reference books.

1st Sem. Lecture 1; required without credit.

121. **Mechanical Drawing.** Use of drawing instruments, practice in lettering and detailing, making of isometric and shop drawings.

1st or 2nd Sem. Labs. 2, 3 hrs.; credit 2.

130. **Forge Work.** Forging and welding iron; forging, dressing, hardening and tempering of steel tools.

1st or 2nd Sem. Labs. 2, 3 hrs.; credit 2; fee $5.00.

140. **Manual Training.** Care and adjustment of hand and power tools, joinery, cabinet making, wood finishing, polishing and varnishing, wood turning, and carving. For students in industrial science and home economics who desire to teach manual training.

1st or 2nd Sem. Prerequisite, must be accompanied by 148; lab. 2, 2 hr.; credit 1⅓; fee $2.00.

141. **Vocational Drawing.** Use of drawing instruments; orthographic projection; isometric and working drawings. For teachers in manual training and consolidated schools.

1st or 2nd Sem. Lab. 2, 3 hrs.; credit 2.

148. **Studies in Manual Training.** Structure of timber, its selection and preparation; wood working tools and care of same; principles of planing, squaring and laying out of work; composition of varnishes, paints, glues and wood finishes and application of same. A general informational subject for students in Agriculture and Manual Training and elective for students in Industrial Science and Home Economics who desire to teach manual training.

1st or 2nd Sem. Prerequisite, classification in 140; lectures and recitations 2; credit 2.

181. **Mechanical Drawing.** Same as 121 but less complete.

1st or 2nd Sem. Lab. 1, 3 hrs.; credit 1.

218. **Technical Lecture.** Elementary principles of construction and operation of steam engines, boilers, and auxiliary power plant apparatus.

2nd Sem. Lecture 1; required without credit.

219. **Projective Drawing.** Principles of projection of the point, line, and plane as applied in the preparation of general and detail engineering drawings of machines and structures.

2nd Sem. Prerequisite 121 or 181; recitation 1; lab. 2, 3 hrs.; credit 3.

220. **Projective Drawing.** Same as 219 but less complete.

2nd Sem. Prerequisite 121 or 181; recitation 1; lab. 1, 3 hrs.; credit 2.

232. **Foundry Work.** Molding in green and dry sand, making cores, charging cupola, casting in iron, brass, mixtures and alloys.

1st or 2nd Sem. Labs. 2, 3 hrs.; credit 2; fee $5.00.

245. **Vocational Wood Work.** Advanced work in manual training for teachers; courses of instruction for rural and graded schools; detailed study of tools; bench and lathe work to meet needs of individual students.

1st or 2nd Sem. Prerequisite 140, or equivalent, and 141 and 148; lab. 2, 2 hrs.; credit 1⅓; fee $2.00.

250. **Shop Organization.** Planning of manual training rooms, selection and location of equipment, and estimating cost; study of tool processes and projects suitable for grade and advanced pupils; study of home and community interests; methods of arousing and maintaining pupils' interest. Elective for students in Agriculture and Manual Training.

1st Sem. Prerequisite, preceded or accompanied by 245; lectures and recitations 2; credit 2.

272. **Elementary Mechanical Drawing.** Sketching of machine parts; preparation of scaled shop drawings; tracing and blue printing.

2nd Sem. Prerequisite 141; lab. 1, 3 hr.; credit 1.

322. **Mechanical Drawing.** Sketching of machine details, preparation of scaled shop drawings, lettering, tracing, and blue printing.

3rd Sem. Prerequisites 121 or 181 and 219 or 220; labs. 2, 3 hrs.; credit 2.

331. **Pattern Work.** Principles of joinery, wood turning, carving, and foundry practice applied to making of simple patterns and core boxes for cast iron, brass, and aluminum castings.

3rd or 4th Sem. Prerequisite 232; labs. 2, 3 hrs.; credit 2; fee $5.00.

375. **Applied Mathematics.** A review of certain mathematical principles and their application in solving problems arising in agriculture and the trades. Open only to students in Agriculture and Manual Training.

3rd Sem. Prerequisites Math. 17 and 32 and classification in Physics 205; recitations 3; credit 3.

382. **Mechanical Drawing.** Same as 322 but less complete.

3rd Sem. Prerequisites 121 or 181 and 219 or 220; lab. 1, 3 hrs.; credit 1.

401. **Mechanics of Engineering.** Principles of pure mechanics as applied in engineering problems involving statics, graphics, and strength of materials.

4th or 5th Sem. Prerequisite Math. 44; recitations 3; credit 3.

423. **Kinematic Drawing.** Study of mechanisms; location of virtual centers, construction of velocity and acceleration diagrams, cams and linkages.

4th Sem. Prerequisite 322; lab. 1, 3 hr.; credit 1.

437. **Advanced Pattern Work.** Special pattern work; gearing, sweep and molding machine work.

4th or 5th Sem. Prerequisite 331; lab. 1, 3 hr.; credit 1; fee $2.00.

439. **Pipe Fitting.** Steam fitting and plumbing, cutting and making up threaded, flanged, and leaded joints, radiator and trap connections.

4th or 5th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

483. **Mechanical Drawing.** Working drawings, tracing, and blue prints of complete machines and their details.

4th Sem. Prerequisite 322 or 382; labs. 2, 3 hrs.; credit 2.

502. **Mechanics of Engineering.** Principles of pure mechanics as

applied in engineering problems involving dynamics, flexure of beams and columns, plain and reinforced concrete construction.

5th or 6th Sem. Prerequisite 401; recitations 5; credit 5.

503. **Materials of Construction.** Manufacture, properties, and uses of iron, steel, brass, bronze, wood, brick, cement, and concrete.

5th Sem. Prerequisites 401 and Chem. 103 or 104; recitations 2; credit 2.

512. **Mechanical Laboratory.** Properties of materials; calibration of gauges, indicator springs, weirs, meters, and transmission dynamometers; study of steam calorimeters; flue gas analysis; indicator practice.

5th Sem. Prerequisites 401 and Chem. 155; lab. 1, 3 hrs.; credit 1; fee $3.00.

516. **Mechanical Laboratory.** Calibration of instruments, indicator practice, valve setting of engines and pumps, efficiency tests of steam and gasoline engines, boilers, and pumps.

5th Sem. Prerequisites, classification in 502, and Chem. 104; labs. 2, 3 hrs.; credit 2; fee $5.00.

524. **Valve Gear Design.** Study of mechanisms, use of Bilgram and Zeuner valve diagrams, slide and Corliss valve gear design.

5th Sem. Prerequisite 423; lab. 1, 3 hr ; credit 1.

533. **Machine Work.** Use of hand and machine tools; working iron, steel, and brass; finishing and assembling of machines and parts.

4th or 5th Sem. Prerequisite 130; labs. 2, 3 hr ; credit 2, fee $5.00.

588. **Mechanics of Engineering.** Principles of pure mechanics as applied in engineering problems involving flexure of beams and columns, rectilinear and curvilinear motion, kinetics, friction, work, energy.

5th Sem. Prerequisites 401 and Math. 45, recitations 5, credit 5.

605. **Machine Design.** Elements of machines, design of fastenings, joints, gearing, belting, lubrication, machine frames and attachments.

6th Sem. Prerequisites 502, 503, and 512; recitations 3, credit 3.

613. **Mechanical Laboratory.** Coal and oil analysis; Corliss and slide valve setting; efficiency tests of water motors, injectors, simple steam engines, and boilers.

6th Sem. Prerequisite 512 and classification in 660; lab 1, 3 hrs.; credit 1; fee $3.00.

625. **Machine Drawing.** Boiler design, study of form, strength, and proportions of frames and moving parts of punches and cranes.

6th Sem. Prerequisites 423, 502, and 512; lab. 1, 3 hrs.; credit 1.

634. **Machine Work.** Operation and management of the lathe, boring mill, and planer, grinding and adjustment of tools, building and repairing machines and machine parts.

6th or 7th Sem. Prerequisite 533; labs. 2, 3 hrs.; credit 2; fee $5.00.

642. **Seminar.** Journal reviews, papers and discussions.

6th Sem. Prerequisite English 115; weekly meeting 1; required without credit.

660. **Hydraulics.** The mechanics of fluids; principles of fluid pressure; stability of structures; flow of liquids and gases; fundamental principles of hydraulic machinery.

6th Sem. Prerequisite 502; recitations 3; credit 3.

664. **Thermodynamics.** Fundamental laws and development of gen-

eral equations; laws of gases and gaseous mixtures; properties of saturated and superheated vapors with applications.

5th or 6th Sem. Prerequisites Math. 45, Physics 303; recitations 3; credit 3.

671. **Mechanics.** Elementary study in applied mechanics not requiring calculus; study of forces and couples; rope and chain tackle; belting; straight line and curvilinear motion; work, energy, and friction; study of lubricants and lubrication.

6th Sem. Prerequisites 375 and Phys. 205; recitations 3; credit 3.

704. **Steam Engines and Turbines.** Applications of the laws of thermodynamics; theory of heat energy and its transformation into work with particular reference to the steam engine, steam turbine, air compressor, and refrigerating machine.

6th or 7th Sem. Prerequisites 664 and classification in 714; recitations 3; credit 3.

707. **Heating and Ventilating.** Ventilation of houses, factories, and public buildings; air washing and moistening; computation of heat losses; design of hot air, steam, and hot water systems; heat regulation and control.

7th Sem. Prerequisites, classification in 726, Physics 303; recitations 2; credit 2.

710. **Gas Engines and Producers.** Applications of the laws of thermodynamics; theory of heat energy and its transformation into work, with particular reference to the gas producer and internal combustion engine.

7th Sem. Prerequisites 664 and classification in 714; recitations 3; credit 3.

714. **Steam and Gas Laboratory.** Study of construction, operation, and economy of fan blowers; gas, gasoline, and oil engines, simple and compound steam engines, steam turbines and pumps.

7th Sem. Prerequisites 613; lab. 1, 3 hrs.; credit 1; fee $5.00.

726. **Heating Design.** Computation of air requirements, heat losses, design of heating and ventilating systems, location of apparatus, layout of piping, low pressure district heating systems.

7th Sem. Prerequisites 605, 625, and classification in 707; labs. 2, 3 hrs.; credit 2.

735. **Machine Work.** Advanced machine work, tool making, milling, grinding, fitting, and assembling.

7th or 8th Sem. Prerequisite 634; labs. 2, 3 hrs.; credit 2; fee $5.00.

743. **Seminar.** Written papers and discussions of selected or assigned topics.

7th Sem. Prerequisite English 116; weekly meeting; required without credit.

773. **Strength of Materials.** Manufacture, properties, and uses of the materials of construction; experimental study of strength and determination of unit stresses.

7th Sem. Prerequisites 671 and Chem. 104; recitation 1; lab. 1, 3 hr.; credit 2; fee $3.00.

776. **Repair Shop Work.** General vocational work in soldering, brazing, riveting, belt gluing and lacing; babbitting and fitting of bearings; pipe fitting; millwrighting.

7th or 8th Sem. Prerequisites 130, 245, and 533; lab. 1, 3 hr.; credit 1; fee $3.00.

785. **Machine Design.** Elements of machines, design of fastenings, transmission apparatus, gearing, belting, lubrication, machine frames and attachments.

7th Sem. Prerequisites 502, 503, and 512; recitations 3; credit 3.

790. **Principles of Motor Car Construction and Performance.** Functions of component parts; relative merit of different conventional types of construction; running gear parts, power plant, carburetor and fuels, ignition, lubrication, cooling, automatic starting, transmission. Only so much theory as will benefit the student who expects to purchase, to own, or to operate a motor car.

1st, 3rd, 5th, or 7th Sem. Lectures 2; outside reading and preparation of notes 1 hr.; credit 1.

791. **Gasoline Automobile.** Fundamentals of modern automobile construction and operation; motors with their starting, ignition, timing, cooling, and oiling systems; clutch; transmission and drive shaft; axles; differential; springs; car operation and control.

7th Sem. Prerequisite, classification in 710 and 796; lectures and recitations 3; credit 3.

795. **Motor Car Laboratory.** Lubrication, care and adjustment of running gear and transmission parts, inspection and adjustment of types of axles and of anti-friction bearings, motor assembly and adjustment, fitting of bearings, setting, grinding and adjustment of valves, carburetor adjustment, setting and adjustment of different types of ignition systems, exercises in care and adjustment of the different units of electric lighting and starting systems, systematic location of motor troubles, testing of power by absorption and by traction dynamometer.

1st, 3rd, 5th, or 7th Sem. Accompanied or preceded by M. E. 790; lab. 1, 3 hrs.; credit 1; fee $2.00.

796. **Automobile Laboratory.** Details of automobile construction and operation from working parts and models taken up in 791; descriptions, sketches, and written reports.

7th Sem. Prerequisite, classification in 791; lab. 1, 3 hrs.; credit 1; fee $3.00.

808. **Railway Mechanical Engineering.** Study of the locomotive and air brake systems; counterbalancing, design of rods, spring rigging, driving axles and valve gears; calculations of tractive effort and train resistance; locomotive, freight and passenger car air brake equipment.

8th Sem. Prerequisite, senior classification; recitations 3; credit 3.

809. **Power Plant Engineering.** Construction, operation, and maintenance of principal and auxiliary power plant machinery; location and design of plant; economics and cost of power; central station heating, lighting, and pumping plants.

7th or 8th Sem. Prerequisite, senior classification; recitations 3; credit 3.

811. **Thesis.** Research work on an approved topic chosen before the end of the first semester of the senior year. A review of literature of the subject is combined with a report of the investigations and conclusions to form a graduating thesis. Expenses of the thesis are adjusted by special arrangement in each case.

8th Sem. Prerequisite, senior classification; labs. 4, 3 hrs.; credit 4.

815. **Steam and Gas Laboratory.** Advanced thermal study of the simple and compound steam engine, steam turbine, multi-stage air compressor, gas producer and engine, refrigerating machine; use of superheated steam, steam jackets, receiver, intercooler, condensers; complete reports on mechanical and thermal efficiencies and cost of power.

8th Sem. Prerequisites 664, 714, and classification in 704 or 710; lab. 1, 3 hrs.; credit 1; fee $5.00.

827. **Crane Design.** Computations and design of power crane; complete detailed drawings of girder and trolley.

8th Sem. Prerequisite, all work of junior year; labs. 3, 3 hrs.; credit 3.

828. **Gas Engine Design.** Complete calculations and drawings of gas or other internal combustion engine.

8th Sem. Prerequisites, work of junior year and 710; labs. 3, 3 hrs.; credit 3.

844. **Seminar.** Written papers and discussions of selected or assigned topics.

8th Sem. Prerequisite 743; weekly meeting; required without credit.

853. **Shop Economics.** Shop location, design and arrangement of buildings; organization and management; distribution of costs, time study, wage systems.

6th or 8th Sem. Prerequisite, junior or senior classification; recitations 2; credit 2.

889. **Power Engineering.** Operation and maintenance of steam and gas engines, steam boilers, pumps, concrete mixers, hoists, and other machinery used in construction work. Arranged for senior students in civil engineering.

8th Sem. Recitations 2; lab. 1, 3 hrs.; credit 3; fee $3.00.

892. **Automobile Chassis.** Detailed study of stresses in frame, brackets, clutch, transmission, axles, springs, brake rigging, and steering mechanism; study of materials and determination of shape and size of parts.

8th Sem. Recitations 2; credit 2.

897. **Automobile Testing.** Testing of automobiles for power, fuel consumption, mechanical and thermal efficiencies, adjustment of carburetors, ignition and timing systems.

8th Sem. Prerequisite 796; lab. 1, 3 hr.; credit 1; fee $3.00.

898. **Automobile Motor Design.** The theoretical determination of stresses, computing of dimensions, and detailed design of an automobile motor unit.

8th Sem. Prerequisites 605, 710, and 791; lectures, computations, and laboratory 3, 3 hr.; credit 3.

1051. **Railway Mechanical Engineering.** Special advanced studies in car construction and design; study of design and operation of air brakes, together with theory of braking and the application to operation of trains; locomotive design, operation, and tests; railway shop design and management; railway hydraulic and pneumatic machinery; and special independent research of the many problems of railway mechanical engineering. The completion and equipment of the Transportation Building, with its locomotive testing laboratory, affords excellent opportunities for advanced research and graduate study along this important line. The Chicago and

Northwestern Railway Company is coöperating fully with the College in work of this nature. PROFESSORS MEEKER, NORMAN, CLEGHORN

**Open for major or minor subjects. Fees for laboratory work will be specially arranged.**

## MILITARY SCIENCE AND TACTICS

GENERAL LINCOLN, Transportation Building, Room 207
Lieutenant Colonel Byrne, U. S. A.

*For information concerning the Division of Industrial Science, see page 76.*

The instruction in this department is intended not to complete the education of a thorough soldier, but to fit young men for filling intelligently positions in the State troops as line officers and company instructors. The chief advantages derived are the acquirement of a dignified carriage of person, a gentlemanly deportment, and a self-respecting discipline, with habits of neatness, order, and punctuality.

All male students of the Freshman and Sophomore years, except such as may be excused by proper authority on account of physical disability or religious belief, are required to become members of the College Cadet Corps, and wear the prescribed military uniform during military exercises.

Students who are excused on account of religious belief must, if they are under twenty-one years of age, present to the President written request from their parents. Such request must be accompanied by a written certificate from the proper church authorities, showing that the parents are members in good standing of either the Quaker or Dunkard church. If the student is over twenty-one years of age, he must present a certificate from the proper church authorities, showing that he is a member in good standing of either the Quaker or Dunkard church.

No substitute for military drill will be allowed.

All students of the College battalion will be measured for uniforms the second week in each semester, at which time a deposit of $5.00 is required.

**Rifle Practice.** The Federal Government supplies arms and ammunition, so that students taking the military drill may also have an opportunity to receive instruction with the arms and equipment of the Regular Army. Because of the limited accommodation of the temporary target range, this work is at present optional. No credit is given, but students enrolling for this work will be expected to attend regularly. Ability to handle fire arms safely and skillfully is as necessary a part of a young man's physical equipment as proficiency in swimming, skating, boxing, baseball, tennis, or any other manly sport.

## RESERVE OFFICERS' TRAINING CORPS

Under the provisions of act of Congress of June 3rd, 1916, there has been established at Iowa State College an Infantry Unit of the Reserve Officers' Training Corps. All members of the college cadet corps whose

bodily condition indicates that they are physically fit to perform military duty, or will be so upon arrival at military age, and who are not members of the Army, Navy or Marine Corps, or of the National Guard or of the Naval Militia, will be enrolled during their Freshman and Sophomore years in the R. O. T. C. All students enrolled will be required to present credit in Military 1, 2, 3, and 4 before graduation.

Under provision of the law all students enrolled in the R. O. T. C. will be supplied by the federal government with the following uniform, or with commutation therefor if supplied by the student:

1 breeches, woolen, olive drab, pair.
1 cap, olive drab.
1 coat, woolen, olive drab.
1 leggings, canvas, pair.
1 cap and collar ornament, set.
1 shoes, russet, pair.

Such members of the R. O. T. C. as agree in writing to participate in such camps of instruction as the Secretary of War shall prescribe will be furnished with additional uniform.

The work outlined for Freshman and Sophomore members of the R. O. T. C. is that given in General Order 49 of the War Department. In each semester of the Freshman year two hours per week of physical drill and lecture on personal hygiene and first aid will be taken in the Department of Physical Training; during the Sophomore year one hour per week of this work will be taken. Two hours of practical military work, including drill, rifle practice, etc., and one hour lecture and recitation work in theory of Military Science and Tactics will be required during both Freshman and Sophomore years.

Members of the R. O. T. C. who have completed the work of the Freshman and Sophomore years, upon recommendation of the professor of Military Science and Tactics and selection by the President of the college may continue this work in the R. O. T C during their Junior and Senior years, providing they execute the following written agreement:

.....191...

"In consideration of commutation of subsistence to be furnished me in accordance with the law, I hereby agree to continue in the Reserve Officers' Training Corps during the remainder of my course at Iowa State College, to devote five hours per week during such period to the military training prescribed, and to pursue the courses of camp training during such period prescribed by the Secretary of War.

Witness..... Signature....."

Students selected in accordance with the preceding provisions will be provided during their Junior and Senior years with commutation of subsistence, amounting to from nine to fifteen dollars per month. The government will also provide uniforms and equipment.

In general, appointments to positions as cadet officers and non-commissioned officers for the R. O. T. C. will be made only from members of the Junior and Senior classes, and from members taking post graduate

courses. As stated in the War Department order, "It is the intention to give the student entering the advanced course the benefit of an opportunity of training in a responsible, rather than in a subordinate position, and also to permit the professor of Military Science and Tactics to determine his proficiency at different periods of the practical part of the prescribed course. It will also afford the professor of Military Science and Tactics the opportunity to recommend that said student discontinue his work in the department in case he is not found to be competent and his work not up to the required standard."

Certain specially qualified students from the Senior class each year will be recommended for appointment by the President of the United States as temporary second lieutenants in the Regular Army for a period of six months.

The work of the Senior College members of the Reserve Officers' Training Corps is based upon the outline of the War Department.

It should be noted that the enrollment in the advanced work of the R. O. T. C. is not expected to interfere seriously with the regular prescribed work of the various technical courses of study outlined in the catalogue, except that provision is made in every such course for the inclusion under the headings of options and electives of the work of the R. O. T. C. for the specially designated students.

### Outline of Advanced (Senior College) Course in R. O. T. C.

*In the Junior and Senior years of each collegiate course of study given in the catalogue, certain subjects are marked with the dagger (†), and a reference is made to the Reserve Officers' Training Corps work as here outlined. If the student is appointed to the Reserve Officers' Training Corps, he may omit all or part of the subjects thus marked, in each semester, provided that in omitting these subjects he does not omit more credit hours than the Reserve Officers' Training Corps requires of him for the same semester. If the omitted subjects would exceed the number of hours required for the Training Corps, an elective must be taken which will bring the total number of hours for the semester up to the requirements specified for that semester in that course of study.*

#### Infantry Unit

At some time before graduation, at least six credits in a modern language, German, French or Spanish, will be required.

#### JUNIOR YEAR

| Fifth Semester | Sixth Semester |
|---|---|
| Military 5a. Credit 2, including: Drill and field work as cadet officers or non-commissioned officers, 2 hrs. per week. Officers' school for infantry. Rec. and lec. 1 hr. per week. Military reconnaissance and sketching, map | Military 6a. Credit 2, including: Drill and field work as cadet officers or non-commissioned officers, 2 hrs. per week. Officers' school for infantry. Rec. 1 hr. per week. Military Sanitation and Hygiene., lec. 1 hr. per week. |

maneuvers, etc., lec., field and lab. 1-3 hrs.

International Law and Psychology of War, lec. 1 hr. per week.

SENIOR YEAR

Seventh Semester

Military 7a. Credit 2, including: Drill and field work as cadet officers, 2 hrs. per week. Officers' school, infantry, 1 hr. per week. Military sketching, map maneuvers and tactical problems, field and drawing room, 1-3 hrs. per week.

Eighth Semester

Military 8a. Credit 2, including: Drill and field work as cadet officers, 2 hrs. per week. Officers' school, infantry, 1 hr. per week. History of military and foreign policy of the United States, lectures 2 hrs. per week.

Students in Engineering or others having suitable preparation may substitute either of the following outlines. While primarily designed for Infantry Units, they nevertheless allow of somewhat more emphasis upon engineering application.

INFANTRY UNIT, PRIMARILY FOR STUDENTS IN ENGINEERING

At some time before graduation, at least six college credits in a modern language, German, French or Spanish, will be required.

JUNIOR YEAR

Fifth Semester

Military 5b. Credit 2, including: Drill and field work as commissioned officers, 2 hrs. per week. Officers' school, lec. 1 hr. per wk. Military sanitation and hygiene, lec. 1 hr. per week. Military reconnaisance and sketching, map maneuvers, etc., lec. and field work 1-3 hrs. per week.

Sixth Semester

Military 6b. Credit 2, including: Drill and field work as commissioned officers, 2 hrs. per week. Officers' school, lec. 1 hr. per wk. Military engineering, rec. 1 hr. or lab. 3 hrs. per week. International law, lec. 1 hr. per week.

SENIOR YEAR

Seventh Semester

Military 7b. Credit 2, including: Drill and field work as commissioned and non-commissioned officers, 2 hrs. per week. Officers' school, lec. 1 hr. per week. Military engineering, Engineers' Field Manual, lec. 1 hr. or lab. 3 hrs. per week. Military reconnaissance and sketching, map maneuvers and tactical problems, lec. 1 hr. or lab. 3 hrs. per week.

Eighth Semester

Military 8b. Credit 2, including: Drill and field work as commissioned and non-commissioned officers, 2 hrs. per week. Officers' school, lec. 1 hr. per week. History of military and foreign policy of the United States, lec. 2 hrs. per week.

### Infantry Unit, Special Emphasis Upon Signal Work

Before graduation a student must secure at least six college credits in a modern language, German, French or Spanish.

JUNIOR YEAR

| Fifth Semester | Sixth Semester |
|---|---|
| Military 5c. Credit 2, including: Drill and field work as commissioned and non-commissioned officers, 2 hrs. per week. Officers' school, rec. 1 hr. per week. Signal code practice, lec. and lab. 3 hrs. per week. Military sanitation and hygiene, lec. 1 hr. per week. | Military 6c. Credit 2, including: Drill and field work as commissioned officers, 2 hrs. per week. Officers' school, rec. 1 hr. per week. Military reconnaissance and sketching, map maneuvers, etc., lec. 1 hr. or lab. 3 hrs. per week. International law, rec. 1 hr. per week. |

SENIOR YEAR

| Seventh Semester | Eighth Semester |
|---|---|
| Military 7c. Credit 2, including Drill and field work as commissioned and non-commissioned officers, 2 hrs. per week. Officers' school, rec. 1 hr per week. Advanced reconnaissance and sketching, map maneuvers, minor tactics, lec. 1 hr. or lab. 3 hrs per week. Advanced signal code practice, lab. and lec. 3 hrs. per week. | Military 8c. Credit 2, including: Drill and field work as commissioned and non-commissioned officers, 2 hrs. per week. Officers' school, rec. 1 hr. per week. History of military and foreign policy of the United States, lec. 2 hrs. per week. |

### Emergency Military Work

During the continuance of the participation of the United States in the war, all Senior College students, not members of the R. O. T. C., will be required to take three hours per week of military work.

### Course in Industrial Science—Major Military Science and Tactics

This course is designed primarily to fit men who wish to prepare themselves to enter the Regular Army, and to prepare them for positions as officers. It may also be pursued with profit by those who wish to train themselves for positions of responsibility in the National Guard while securing a scientific and technical education.

It may be emphasized that it is increasingly difficult, if not impossible, to secure appointments as commissioned officers in the Regular Army without college training. Recent Federal legislation makes it possible for college graduates who have taken certain military subjects to take examinations for such Army appointments.

Students who wish to enter most branches of the service will find it possible to outline a course of study which will fit their particular need,

by pursuing this major in Military Science and Tactics. The elective subjects of the Sophomore, Junior, and Senior years are chosen in consultation with the Commandant, and must meet his approval. In this manner it is possible to outline a course which will fit a student for any one of the following branches of the service: Infantry, Cavalry, Field Artillery, Coast Artillery, Ordnance, Signal Corps, or Quartermaster Corps.

Students who desire to take examinations for appointment in the Engineer Corps are advised to register in one of the regular engineering courses and complete the work of the Reserve Officers' Training Corps.

Those who wish to enter the service as Veterinarians should enroll in the course in Veterinary Medicine

For the Freshman and Sophomore years, see page 246.

For general instructions as to Senior college work, see page 247. A student majoring in Military Science and Tactics will take a total of at least 10 hours of work in this department during the Junior and Senior years. The remainder of the 20 hours major required shall be chosen by the head of the department from such other subjects as are essential to the proper development of the major work. The following subjects should be taken during the Junior and Senior years: Military Science 7, 8, 9b, 10b, 11b, and 12b.

## Description of Studies

| Groups | |
|---|---|
| General | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 |

NOTE: It should be noted that a part of the requirements for membership in the R. O. T. C. are met by the work in physical drill, personal hygiene and first aid taken in the Department of Physical Training during the Freshman and Sophomore years.

1. **Military Art.** Two hours per week of infantry drill to include the School of the Soldier, Squad and Company, close and extended order, and preliminary instruction in sighting position, aiming drills, gallery practice, and nomenclature and care of rifle and equipment. One hour class work on theory of target practice, military organization, map reading and service of security.

1st Sem. Drills 2; lecture 1; credit 1.

2. **Military Art.** Two hours per week of infantry drill to include School of Battalion, special attention devoted to fire direction and control; ceremonies' manuals; intrenchments; range and gallery practice. One hour class work to include U. S. Infantry Drill Regulations through School of the Company, service of information and elementary instruction in combat.

2nd Sem. Prerequisite 1; drill 2; lecture 1; credit 1.

3. **Military Art.** Two hours per week infantry drill; continuation of 2, combat firing. One hour class work in U. S. Infantry Drill Regulations, to include School of Battalion and Combat, Small Arms Firing Regulations, map reading, camping regulations.

3rd Sem. Prerequisite 2; drills 2; lecture 1; credit 1.

4. **Military Art.** Two hours per week infantry drill; continuation of 3, signaling, semaphore and flag, sand table work, range practice. One

hour class work on service of information and security and marches and camps.

**4th Sem. Prerequisite 3; drills 2; lecture 1; credit 1.**

5a. **Military Art.** Infantry R. O. T. C. Drill and field work as cadet officers or non-commissioned officers in the cadet corps, two hours per week. Officers' school for infantry, rec. 1 hr. per week. Military reconnaissance and sketching, map maneuvers, etc. Lecture and Field Work, 1 to 3 hours. Department of Civil Engineering and the Department of Military Science and Tactics.

**5th Sem. Prerequisite 4; drill and field work 2; rec. 1 to 2; lab. 0 to 3; credit 2.**

5b. **Military Art.** Engineers, R. O. T. C. Drill and field work and other duties as commissioned and non-commissioned officers of cadets, two hours per week. Officers' school, 1 hr. per week. Military sanitation and hygiene, lecture 1 hr. per week. Department of Bacteriology and Hygiene. Military Reconnaissance and Sketching, map maneuvers. Lecture 1, or lab. 3 hrs. per week. Department of Civil Engineering.

**5th Sem. Prerequisite 4; drill and field work 2; lecture 2-3; lab. 0-3; credit 2.**

5c. **Military Art.** Signal Corps, R. O. T. C. Drill, field work and other duties as commissioned or non-commissioned officers of cadets. 2 hrs. per week. Officers' school, 1 hr. per week. Military Sanitation and Hygiene, lecture 1 per week. Department of Bacteriology and Hygiene. Signal Corps Practice, lectures on signal corps work with code practice. Lectures and laboratory 3 hours per week, on separate days. Department of Electrical Engineering.

**5th Sem. Prerequisite 4; drill and field work 2; lectures 2-3; lab. 2-3; credit 2.**

6a. **Military Art.** Infantry, R. O. T. C. Drill and field work, continuation of 5a, 2 hrs. per week. Officers' school, lecture 1 hr. per week. International Law and Psychology of War, lecture 1 per week. Department of History and Psychology. Military Sanitation and Hygiene, lecture 1 per week. Department of Bacteriology and Hygiene.

**6th Sem. Prerequisite 5a; drill and field work 2; lectures 3; credit 2.**

6a. **Military Art.** Infantry, R. O. T. C. Drill and field work, continuation of 5b, 2 hrs. per week. Officers' school, lecture 1 hr. per week. International Law and Psychology of War. Lecture 1 per week. Department of History and Psychology. Military Engineering. Military Engineers' Handbook, rec. 1, or laboratory 3 hrs. per week. Department of Civil Engineering.

**6th Sem. Prerequisite 5b; drill and field work 2; lectures 2-3; laboratories 0-3; credit 2.**

6c. **Military Art.** Signal Corps, R. O. T. C. Drill and field work, continuation of 5c, 2 hrs. per week. Officers' school, lecture 1 hr. per week. International Law and Psychology of War, lecture 1 hr. per week. Department of History and Psychology. Military Reconnaissance and Sketching, map maneuvers, etc, lecture 1, or laboratory 3 hrs. per week. Department of Civil Engineering.

**6th Sem. Prerequisite 5c; drill and field work 2; lectures 2-3; laboratories 0-3; credit 2.**

7a. **Military Art.** Infantry, R. O. T. C. Drill and field work, continuation of 6a, 2 hrs. per week. Officers' school, lecture 1 hr. per week. Advanced Military Sketching, map maneuvers, minor tactical problems, lectures 1 hr. per week, or laboratory 3 hrs. per week. Departments of Civil Engineering and Military Science and Tactics.

7th Sem. Prerequisite 6a; drill and field work 2; lectures 1-2; laboratory 1-3 hrs. per week; credit 2.

7b. **Military Art.** Engineers, R. O. T. C. Drill and field work, continuation of 6b, 2 hrs. per week. Officers' school, lecture 1 hr. per week. Advanced Military Sketching, map maneuvers, and minor tactical problems, lecture 1 hr. or laboratory 3 hrs. per week. Departments of Civil Engineering and Military Science and Tactics, Military Engineering. Engineers' Field Manual, lecture 1 hr. or lab. 3 hrs. per week. Department of Civil Engineering.

7th Sem. Prerequisite 6b; drill and field work 2; lectures 1-3; lab. 0-6; credit 2.

7c. **Military Art.** Signal Corps, R. O. T. C. Drill and field work, continuation of 6c, 2 hrs. per week. Officers' school, lecture 1 hr. per week. Advanced military sketching, map maneuvers, and tactical problems, lecture 1 hr. or laboratory 3 hrs. per week. Department of Civil Engineering and Military Science and Tactics. Advanced Signal Corps Practice, lectures and laboratory 3 hrs. per week on different days. Department of Electrical Engineering.

7th Sem. Prerequisite 6c; drill and field work 2; lectures 1-3; laboratory 2-6; credit 2.

8a. **Military Art.** Infantry, R. O. T. C. Drill and field work, continuation of 7a, 2 hrs. per week. Officers' school, lecture 1 hr. per week. History of Military and Foreign Policy of the United States, lectures 2 hrs. per week. Department of History and Psychology.

8th Sem. Prerequisite 7a; drill and field work 2; lectures 3; credit 2.

8b. **Military Art.** Engineers, R. O. T. C. Drill and field work, continuation of 7b, 2 hrs. per week. Officers' school, lecture 1 hr. per week. History of Military and Foreign Policy of the United States, lectures 2 hrs. per week, Department of History.

8th Sem. Prerequisite 7b; drill and field work 2; lectures 3; credit 2.

8c. **Military Art.** Signal Corps, R. O. T. C. Drill and field work, continuation of 7c, 2 hrs. per week. Officers' school, lecture 1 hr. per week. History of Military and Foreign Policy of the United States, lectures 2 hrs. per week, Department of History.

8th Sem. Prerequisite 7c; drill and field work 2; lectures 3; credit 2.

## Military Courses Required of Senior College Students Not Members of the Advanced Course R. O. T. C. During the War

9a. **Military Art.** Infantry. Drill and field work as infantry. Elementary reconnaissance and sketching, 2 hrs. per week.

Officers' school, lecture 1 hr. per week.

5th Sem. Prerequisite 4; drill and field work 2; lecture 1; credit 1.

9b. **Military Art.** Engineers. Drill and field work as an engineering unit. Lectures on military engineering, military reconnaissance and sketching, 2 hrs. per week.

Officers' school, lecture 1 hr. per week.

5th Sem. Prerequisite 4; drill and field work 2; lecture 1; credit 1.

9c. **Military Art.** Signal Corps. Drill and field work as Signal Corps unit. Lectures and laboratory practice on signal codes and signal corps work, 2 hrs. per week.

Officers' school, lecture 1 hr. per week.

5th Sem. Prerequisite 4; drill and field work 2; lecture 1; credit 1.

10a. **Military Art.** Infantry. Drill, field work and officers' school, continuation of 9a.

6th Sem. Prerequisite 9a; drill and field work 2; lecture 1; credit 1.

10b. **Military Art.** Engineers. Drill, field work and officers' school, continuation of 9b.

6th Sem. Prerequisite 9b; drill and field work 2; lecture 1; credit 1.

10c. **Military Art.** Signal Corps. Drill, field work and officers' school, continuation of 9c.

6th Sem. Prerequisite 9c; drill and field work 2, lecture 1; credit 1.

11a. **Military Art.** Infantry. Drill and field work, continuation of 10a, 2 hrs. per week. Military Sanitation and Hygiene, lecture 1 hr. per week. Department of Bacteriology and Hygiene.

7th Sem. Prerequisite 10a; drill and field work 2; lecture 1, credit 1.

11b. **Military Art.** Engineers. Drill and field work, continuation of 10b. Military Sanitation and Hygiene, lecture 1 hr. per week. Department of Bacteriology and Hygiene.

7th Sem. Prerequisite 10b; drill and field work 2, lecture 1; credit 1.

11c. **Military Art.** Signal Corps. Drill and field work, continuation of 10c. Military Sanitation and Hygiene, lecture 1 hr. per week. Department of Bacteriology and Hygiene.

7th Sem. Prerequisite 10c; drill and field work 2; lecture 1, credit 1.

12a. **Military Art.** Infantry. Drill and field work, continuation of 11a, 2 hrs. per week. International Law, lecture 1 hr. per week. Department of History.

8th Sem. Prerequisite 11a; drill and field work 2; lecture 1; credit 1.

12b. **Military Art.** Engineers. Drill and field work, continuation of 11b, 2 hrs. per week. International Law, lecture 1 hr. per week. Department of History.

8th Sem. Prerequisite 11b; drill and field work 2; lecture 1; credit 1

12c. **Military Art.** Signal Corps. Drill and field work, continuation of 11c, 2 hrs. per week. International Law, lecture 1 hr. per week. Department of History.

8th Sem. Prerequisite 11c; drill and field work 2; lecture 1; credit 1.

## MINING ENGINEERING

PROFESSOR BEYER, Engineering Hall, Room 303
Associate Professor Hodson

*For information concerning the Division of Engineering, see page 50.*

The course in mining engineering is planned to give the student a ready familiarity with the branches which form the ground work of the science of mining and metallurgy. The Department of Mining Engineering aims to give to him such a thorough training in the fundamentals as will enable him after graduation to acquire in a comparatively short time the practical experience absolutely necessary before he is fitted to assume positions of great responsibility in the mining industries. The course requires four years, and is intended for those students who desire a "thorough course in theoretical and practical mining," and underlying sciences.

Ames is located conveniently to the Iowa coal fields, and students have easy access to the coal mines of Boone and Polk counties. The great centers of the clay industry, Des Moines, Boone, and Fort Dodge, are equally accessible, while the quarries of Marshall County are scarcely more than an hour's ride from the College. These and numerous allied industries are, after all, the most important and indispensable laboratories for the practical mining engineer. The department undertakes to present the accepted theories concerning mineral aggregation, origin, and occurrence, but these theories can be put to test only by an intelligent use of the drill, the level, and the plane table. The accredited methods of winning the ores and minerals receive full discussion in the class room; but this discussion only renders obvious the necessity of becoming familiar with the practical workings of the sluice box, the tipple, and the stamp mill.

It is the settled policy of the department to carry on such investigation work as may be of benefit to the mining and manufacturing interests of the state. In coöperation with the other engineering departments considerable work has been done and is being done on fuels, clays, and structural materials. The department is also prepared to do a limited amount of assaying, to test clays and fuels, do mine surveying, prepare mine maps and plats, examine and report on mine and clay properties for citizens of the state at reasonable cost. The doing of this practical investigation work is necessary to the healthful growth of the engineer.

The work of the first year in mining engineering is exactly the same as that required in the course in mechanical engineering, with the exception that surveying takes the place of mechanical drawing, and the technical lecture is in mining engineering. The student is expected to make either mining, metallurgy, or geology the subject of a special investigation and to embody the results of this investigation in a thesis, which is required of every student who is a candidate for graduation.

Courses in summer field work are offered in the hope that the apprenticeship of the student may be reduced to a minimum. They are required of all students in mining engineering.

## Course in Mining Engineering

Leading to the degree of Bachelor of Science in Mining Engineering. For professional degree, see page 61.

### FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Mn. E. 101[1]: Technical Lecture | R[3] | Mn. E. 220: Technical Lecture | R |
| Chem. 103: General Chemistry | 4 | Chem. 104: General Chemistry and Qualitative Analysis | 4 |
| C. E. 102: Field Work | 2 | C. E. 203: Surveying | 3 |
| Engl. 116: Exposition | 4 | Engl. 117: Narration and Description | 3 |
| Math. 40: College Algebra | 3 | Math. 42a: Plane and Spherical Trigonometry | 1 |
| Math. 41: Plane Trigonometry | 2 | Math. 43: Plane Analytic Geometry | 4 |
| M. E. 121: Mechanical Drawing | 2 | M. E. 220: Projective Drawing | 2 |
| Mil. Sci. 1: Military Art | 1 | Mil. Sci. 2: Military Art | 1 |
| P. T. 1: Phys. Training | R | P. T. 2: Phys. Training | R |
| | 18 | | 18 |
| | | Mn. E. 212: Summer Field Work—Two Weeks | 2 |

### SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Mn. E. 310: Mine Surveying | 3 | Mn. E. 419: Journal Club | R |
| Mn. E. 318: Journal Club | R | Engl. 412: Argumentation | 2 |
| Chem. 157: Quantitative Analysis | 4 | Geol. 1: General Geology | 3 |
| Math. 44: Calculus | 5 | Math. 45: Calculus | 5 |
| M. E. 382: Mechanical Drawing | 1 | M. E. 401: Mechanics of Engineering | 3 |
| Mil. Sci. 3: Military Art | 1 | Mil. Sci. 4: Military Art | 1 |
| Phys. Tr. 3 | R | Phys, Tr. 4 | R |
| Phys. 303: Mechanics and Heat | 5 | Phys. 404: Electricity and Magnetism, Light and Sound | 5 |
| | 19 | | 19 |
| | | Mn. E. 423: Summer Field Work—Two Weeks | 2 |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
[3] R indicates that the study is required, without credit, for graduation.

JUNIOR YEAR

Fifth Semester

| | Credits |
|---|---|
| Mn. E. 502: Principles of Mining | 3 |
| Mn. E. 506: Seminar | R |
| Chem. Engr. 645: Assaying | 3 |
| Geol. 7: Mineralogy | 4 |
| M. E. 502: Mechanics of Engineering | 5 |
| M. E. 512: Mechanical Lab. | 1 |
| Engl. 115: Engineering Engl. | 2 |
| †Mil. Sci. 9: Military Art | 1 |
| | 19[5] |

Sixth Semester

| | Credits |
|---|---|
| Mn. E. 603: Principles of Mining | 3 |
| Mn. E. 614: Metallurgy | 3 |
| Mn. E. 607: Seminar | R |
| C. E. 656: Str. Engineering | 3 |
| Engr. 603: Conservation of Natural Resources | 1 |
| Geol. 4: Advanced Geology | 4 |
| †M. E. 660: Hydraulics | 3 |
| †Mil. Sci. 10: Military Art | 1 |
| | 18[5] |
| Mn. E. 613: Summer Field Work—Four Weeks | 4 |

SENIOR YEAR

Seventh Semester

| | Credits |
|---|---|
| Mn. E. 704: Mining Engineering | 4 |
| Mn. E. 708: Seminar | R |
| Mn. E. 715: Metallurgy | 4 |
| Engr. 702: Specifications and Contracts | 1 |
| Geol. 5: Economic Geology | 4 |
| †E. E. 712: Electrical Machinery | 3 |
| †Mil. Sci. 11: Mil. Art | 1 |
| †Electives | 1 |
| | 18[5] |

Eighth Semester

Credits

| | | |
|---|---|---|
| Mn. E. 809: Seminar | | R |
| Choice | Mn. E. 816: Mining Engr. | 5 |
| | Mn. E. 817: Metallurgy | |
| | Geol. 8: Special Geology | |
| Mn. E. 821: Mine Administration and Mining Law | | 2 |
| Engr. 801: History of Engr. | | 1 |
| C. E. 870: Structural Engr. | | 3 |
| †M. E. 809: Steam Engines and Boilers | | 3 |
| †Mil. Sci. 12: Mil. Art | | 1 |
| †Electives | | 3 |
| | | 18[5] |

## Five-Year Course in Mining Engineering

(Omitted during the period of the war.)

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Engineering. See Business Engineering, page 131.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Technical Lectures | 101[1], 220, 318, 419 | | |
| Seminar | 506, 607, 708, 809, 919, 1020 | | |
| Summer Field Work | 212, 423, 613, 825 | | |
| Metallurgy | | 614, 715, 817 | |
| Mining | 310 | 502, 603, 704, 816, 821 | |

101. **Technical Lecture.** General and elementary principles of mining. Mining terms and local mining methods.
1st Sem. Required

212. **Summer Field Work in Mine Surveying.** Two weeks' work required at the close of the Freshman year, in one of the coal mining districts of the state; comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation. Mine map, and careful report on mine property, accompanied by the necessary illustrations.
2nd Sem. Required.

220. **Technical Lecture.** A continuation of 101. The mining and metallurgical operations to be seen while on the succeeding summer field trip studied with as much detail as the time and student's preparation permit.
2nd Sem. Required.

310. **Mine Surveying.** Especially adapted to mines and tunnels. The use of the auxiliary telescope; the various problems met with in underground surveying illustrated by means of problems taken from actual practice.
3rd Sem. Recitations 3; credit 3.

318. **Journal Club.** Weekly conferences with one or more of the instructors in the department, in which the leading mining journals receive principal attention. Lectures on current topics; the reading of technical journals encouraged.
3rd Sem. Required.

419. **Journal Club.** Continuation of 318.
4th Sem. Required.

423. **Summer Field Work in Mine Surveying.** Two weeks' work, required at the close of the Sophomore year, carried on in one of the coal mining districts of the state; comprises the complete survey of a mine and a thorough examination of the equipment and mode of operation. Mine map, and a careful report on mine property, accompanied by the necessary illustrations.
4th Sem. Required.

502. **Principles of Mining.** Methods employed in excavating, boring

[1] The number refers to the description of the study.

and shaft sinking, mining, and the support of mine excavations. Methods employed in exploration, development, and mine working in general.

5th Sem. Recitations 3; credit 3.

506. **Seminar.** For the purpose of bringing together the Junior and Senior students and the members of the instructing corps for weekly conferences. A discussion of timely topics by the students.

5th Sem. Required.

530. **Assaying.** (Transferred to Chemical Engineering, see page 141.)

603. **Principles of Mining.** Continuation of 502, with special reference to mining machinery. Haulage, hoisting, ventilation, air compression, and transportation.

6th Sem. Recitations 3; credit 3.

607. **Seminar.** Continuation of 506.

6th Sem. Required.

613. **Summer Field Work in the Study of Mine Operation and Equipment, and of Concentrating Plants.** Four weeks' work required of students who have completed the Junior year. A visit to one of the great metal producing centers outside the state. A careful study of mine properties is made, and a detailed report, properly illustrated by sketches and drawings, is required. A portion of the time is devoted to a study of ore dressing and concentrating plants.

6th Sem. Required.

614. **Metallurgy.** Study of refractory materials, fluxes, fuels, and furnaces; also pyrometry, calorimetry, fire clays, and coke; metallurgical furnaces studied from working drawings; introduction to the science of metallography.

6th Sem. Recitations; lab.; credit 3.

618. **Assaying.** (Transferred to Chemical Engineering, see page 141.)

704. **Mining Engineering.** Ore dressing, amalgamation, cyanidation, mine buildings.

7th Sem. Recitations 4; credit 4.

708. **Seminar.** Continuation of 506 and 607.

7th Sem. Required.

715. **Metallurgy.** Processes relating to copper, gold, lead, silver, and zinc. The most important metals and the most important processes.

7th Sem. Recitations 4; credit 4.

809. **Seminar.** Continuation of 506, 607, and 708.

8th Sem. Required.

816. **Mining Engineering.** Mine examinations and reports, mine accounting, mine plant design. Mine plants, new concentration methods. After preliminary work the student will be required to make designs and reports covering given problems. Students electing this work will be expected to write their graduating theses on subjects introduced in this study.

8th Sem. Credit 5.

817. **Metallurgy.** For students who desire to specialize in metallurgy. The subjects will be varied from year to year to suit the needs of the individual students.—Those electing this work will be required to write their graduating theses on subjects introduced in this study.

8th Sem. Credit 5.

821. **Mine Administration and Mining Law.** The broader phases of mine administration, the U. S. mineral land laws, and the common law as affecting mineral deposits.

8th Sem. Recitations 2; credit 2.

825. **Summer Field Work.** Similar to 613.

8th Sem. Required.

919. **Seminar.**

1020. **Seminar.**

## MODERN LANGUAGE

*Professor Briggs, Central Building, Room 120

**Assistant Professor De Vries; Instructors Norton, Lommen, Fairfield, Bassett, Herzog, Chandler

*For information concerning the Division of Industrial Science, see page 76.*

The department of Modern Language selects material to be used in the study of languages so that they will be helpful to the student in the pursuit of the technical subjects which make up the main body of his work. Much of the best technical material is found in the German, French, and Spanish books and publications, not translated into English. Those who can read these languages have an immense advantage over their fellows who cannot.

### Description of Studies

| Groups | Undergraduate |
|---|---|
| French | 1[1], 2, 2a, 3, 3a, 3b, 4, 9, 10 |
| German | 5, 5a, 6, 6a, 7, 7a, 8, 16, 17, 20, 21, 22, 23, 24, 27, 28, 40, 42 |
| Spanish | 30, 31, 36, 37 |

The following studies in this department have been omitted from the Catalogue for the period of the war: 18, 19, 25, and 43.

#### FRENCH

1. **Elementary French.** Grammar and reading with practice in writing and speaking French. Special attention to pronunciation.

Either Sem. Recitations 5 or 3; credit 5 or 3.

2. **Elementary French.** Continuation of 1. Grammar, with special attention to irregular verbs, reading, constant practice in writing and speaking French. (a) The emphasis upon formal grammar may be reduced according to the hours.

2nd Sem. Recitations 3 or 5; credit 3 or 5.

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* Absent on leave second semester.
** Absent on leave first semester.
[1] The number refers to the description of the study.

3. **Modern Prose.** (a) Selected readings; (b) conversation.
1st Sem. Prerequisite 2; recitations 3, 2, or 1; credit 3, 2, or 1.

4. **Modern Prose.** Continuation of 3.
2nd Sem. Prerequisite 3; recitations 3, 2 or 1; credit 3, 2, or 1.

9. **Advanced French Prose.** Readings from varied texts. (a) given in 1917-18 and alternate years; (b) given in 1918-19 and alternate years.
1st Sem. Prerequisite 4; recitations 3; credit 3.

10. **Advanced French Prose.** Continuation of 9. (a) given in 1917-18 and alternate years; (b) given in 1918-19 and alternate years.
1st Sem. Recitations 3; credit 3.

GERMAN

5. **Elementary German.** Grammar and reading; constant practice in pronunciation and in writing German.
Either Sem. Recitations 5; credit 5.

5a. **Intermediate German.** Review of grammar, reading and composition. (Open to those who have offered one year of German for admission.)
1st Sem. Recitations 3; credit 3.

6. **Elementary German.** Continuation of 5. Grammar and reading.
Either Sem. Recitations 5; credit 5.

6a. **Intermediate German.** Continuation of 5 or 5a. Grammar, selected reading and composition.
2nd Sem. Recitations 3; credit 3.

7. **German Prose. Selected Reading.** (a) Additional review of grammar two hours each week required for Home Economics and Science Freshman entering with two years' credit in German.
1st Sem. Recitations 3 or 5; credit 3 or 5.

8. **Selected German Reading.** Continuation of 7 or 7a. A drama, followed by prose reading.
2nd Sem. Recitations 3; credit 3.

16. **Scientific German.** Selected reading in botany, biology, bacteriology, chemistry, and forestry.
1st Sem. Prerequisite 6 or 6a. Recitations 3; credit 3.

17. **Scientific German.** Continuation of 16.
2nd Sem. Recitations 3; credit 3.

20. **Scientific German.** Selected readings in physics (such topics as sound, heat, light, and electricity), chemistry, geology, and mineralogy.
1st Sem. Prerequisite 6 or 6a. Recitations 3; credit 3.

21. **Scientific German.** Continuation of 20.
2nd Sem. Recitations 3; credit 3.

22. **Advanced Scientific German.** German periodicals in engineering, agriculture, and the natural sciences.
Either Semester. Prerequisites 17 or 21; recitations 2 or 3; credit 2 or 3.

23. **Advanced Scientific German.** Continuation of 22.
Either Semester. Recitations 2 or 3; credit 2 or 3.

24. **German Composition and Conversation.** Review of grammar, individual reports in German, and conversation.
1st Sem. Prerequisite 8, 17, or 21; recitations 3; credit 3.

27. **Advanced German Prose.** Varied texts.
1st Sem. Prerequisite 8; recitations 3; credit 3.

28. **Advanced German Prose.** Continuation of 27.
2nd Sem. Recitations 3; credit 3.

40. **Modern German Poetry.** Lyrics and ballads.
2nd Sem. Prerequisite 8; recitations 2; credit 2.

42. **Goethe's Faust.** The first part discussed and interpreted; with supplementary lectures on the Faust literature.
1st Sem. Prerequisite 28; recitations 2; credit 2.

### SPANISH

30. **Elementary Spanish.** Grammar, reading, composition, and conversation. Much attention given to pronunciation. (The emphasis upon formal grammar may be reduced according to the hours.)
Either Sem. Recitations 5 or 3; credit 5 or 3.

31. **Elementary Spanish.** Continuation of 30. Grammar and reading. (The emphasis upon the grammar may be reduced according to the hours.)
2nd Sem. Recitations 5 or 3; credit 5 or 3

36. **Advanced Spanish.** Reading and review of grammar, together with composition.
1st Sem. Recitations 3; credit 3.

37. **Spanish Correspondence and Conversation.**
2nd Sem. Prerequisite 36; recitations 3; credit 3.

## MUSIC

ASSOCIATE PROFESSOR BAILEY, Music Hall
Instructor Schwartz; Assistants Riadessell, Collins

*For information concerning the Division of Industrial Science, see page 76.*

The aim of the Department of Music is to afford students in technical courses who have interest in music a means of developing their musical ability. To provide the student an opportunity for active participation, a number of studies are offered, some of which it is hoped may fit his individual needs and ability.

The Department of Music is housed in a frame building, known as Music Hall, situated about a hundred yards from the Campanile. This building contains four teaching studios and seven practice rooms. Each practice room is equipped with a piano and is well lighted. In addition to the ten pianos in this building there is a pipe-organ in Morrill Hall which is used for teaching and practice. Rehearsals of the various musical organizations are held in the chapel and in the large auditorium at Agricultural Hall.

### Description of Studies

| Group | Undergraduate |
|---|---|
| Music | 1[1], 2, 3, 4, 6 |

The following studies in this department have been omitted from the Catalogue for the period of the war: 5 and 8.

1. **Elementary Chorus.** Designed for students who have had no previous training in music. Elementary theory of music and sight-singing. Attendance at chapel choir may be required. (a) fall semester; (b) spring semester.

Credit 1 for each semester.

2. **Advanced Chorus.** Interpretation of choral works. Chapel service on Sundays, and Festival Chorus work. Admission by competitive examination at the beginning of the year. (a), (b), (c), and (d) successive semesters.

Credit 1 for each semester.

3. **Orchestra.** Designed for students who have made a beginning on an orchestral instrument. Standard orchestral works given in concert during the year. (a), (b), (c), and (d) successive semesters.

Credit 1 for each semester.

4. **Band.** Open to all students by competitive examination. Concerts given during the year. Student assistant leader and librarian at salaries of $75 and $25 appointed from membership. Freshmen and Sophomores admitted to the Band may substitute this work for the prescribed military drill. (a), (b), (c), and (d) successive semesters.

Credit 1 for each semester.

6. **Elementary Harmony.** Up to and including the study of the chord of the dominant seventh, melody writing, harmonizing of basses, and ear-training. (a) fall semester; (b) spring semester.

Recitations 2; credit 2 for each semester.

## PHOTOGRAPHY

ASSOCIATE PROFESSOR COLBURN, Agricultural Hall, Room 31

*For information concerning the Division of Agriculture, see page 45.*

It is the purpose of this department to give technical students theory and practice in photography sufficient to enable them to use this method of illustration in their future work in the different branches of education which they are taking up. The work is individual, and the endeavor is made to train each student to do efficient work in photographic illustration.

The Department of Photography is well equipped for the work.

### Description of Studies

| Groups | Undergraduate |
|---|---|
| Photography | 3[1], 4, 5 |

[1] The number refers to the description of the study.
Not more than 8 total credits in music will be allowed toward graduation.
[1] The number refers to the description of the study.

3. **Agricultural Photography.** History of photography; study of camera types, lenses, shutters, plates, and printing mediums; chemistry of photography, making up of solutions; photographing of trees, shrubs, root formations, flowers, plant life, etc.; field scenes, exteriors, snow scenes, etc.; cattle, horses, sheep, hogs, etc.; making of lantern slides; use of flashlight devices; photography for catalogs and manuscript illustrations; use of photography in schools; micro-photography; color photography of fruits, flowers, etc.; the copying of plans, drawings, illustrations.

**5th, 6th, 7th, or 8th Sem. Prerequisite Junior standing in Chemistry and Physics; lecture 1; lab. 1, 2 hr.; credit 1⅔; deposit $8.50.**

4. **Engineering Photography.** History of photography; study of camera types and their different uses; lenses, shutters, plates, films, printing mediums, etc.; preparation of chemicals for the development of plates, films, and papers; photographing interiors by daylight and artificial light; exterior and architectural details; photographing castings and machinery; details of construction work; catalog illustrations, etc.; a study of systems for handling the photographic data of construction work; the use of smokeless devices in flashlight photography; photography for the courts, handwriting evidence, etc.; plans, drawings, etc.; micro-photography; the use of photography in the schools.

**5th, 6th, 7th, or 8th Sem. Prerequisite same as for 3; lecture 1; lab. 1, 2 hr.; credit 1⅔; deposit $8.50.**

5. **Art and Illustrative Photography.** The history of photography; camera types and their use and operation; study of lenses, shutters, plates, films, printing mediums; the chemistry of photography and preparing of solutions used in developing; composition; trimming and mounting; interior photography; flowers, trees, and plant life; landscape and general view photography; rendering of light and shade; clouds and the use of color filters; use of smokeless devices for flashlight work; photography for catalogs, manuscript illustrations, etc.; cover page studies for magazines; home portraiture; indoor and outdoor; photography for the schools; lantern slide making; enlarging; color photography of fruits, flowers, etc.; copying of plans, drawings, illustrations, etc.

**5th, 6th, 7th, or 8th Sem. Prerequisite same as for 3; lecture 1; lab. 1, 2 hr.; credit 1⅔; deposit $8.50.**

## PHYSICAL CULTURE (For Women)

ASSOCIATE PROFESSOR TILDEN, Women's Gymnasium
Instructors Brooks, Bennett, Peterson

*For information concerning the Division of Home Economics, see page 71.*

Work in the women's gymnasium is required of the young women throughout the Freshman and Sophomore years and is given in two forty-five minute periods each week. Each student is examined at the beginning of her Freshman year and again at the close of her Sophomore year with reference to physical development, strength of heart and lungs, and hereditary tendencies. The work is arranged to meet the needs of students who

have or have not had previous training. No student will be excused from exercises except by order of the college physician and physical director. If excused the student is deprived of the privilege of entering the athletic games.

**Remedial Gymnastics.** Students who are found to be physically unable to carry the work of the regular classes in gymnastics or sports will be assigned to remedial classes. When necessary students will be given private work in medical or remedial gymnastics.

**Equipment.** The women's gymnasium is located in Margaret Hall, and occupies a floor space of 50 by 80 feet It is exceptionally well ventilated, having a high ceiling and windows on three sides, and is completely equipped with standard apparatus of the latest design, especially selected to meet the needs of the women students.

The corrective room is splendidly equipped with the most up-to-date apparatus and appliances.

The new lockers and shower rooms located in the basement of the gymnasium are models of their kind. Each student is provided with a locker arranged for convenience in a dressing room. Showers are connected with drying rooms and are arranged to meet the needs of large classes. Towels and kimonas are furnished by the department to students each class hour.

**Rest Room.** A rest room furnished with cots is under the supervision of the department and open at all times to students who wish to enjoy its privileges.

**Swimming Pool.** The swimming pool is a new addition to the women's gymnasium and has been built in the east end of the basement of Margaret Hall. It is 30 by 40 feet in size and is modern in every respect. A swimming test will be required of all women students unless excused by the college physician and physical director for women. The test must be completed before the grade for fourth semester in Physical Culture shall be granted. The test may be taken any arranged time during the freshman or sophomore years, but will not be offered in the place of the regular indoor work. All swimming outfits will be ordered through the department.

**Athletic Association.** An Athletic Association, with membership open to all women students in the College, has charge of the interclass games; the awarding of basket ball, hockey, tennis, and golf medals; the women's official "Ames" sweater, the "all college" Ames sweater, and the women's "Ames" bleacher blankets; and the "May Day" festivities on the campus.

Four new double tennis courts, a golf course, a hockey field, and an indoor basket ball court, all splendidly equipped, are at the disposal of the young women of the College, free of charge.

**Recommendations.** The department will grant a first grade recommendation to students who have completed two years of the regular course with an average of 85%, and have satisfactorily met the requirements in

practice teaching; and a second grade recommendation to students who have completed one year of the regular course with an average of 85% and have satisfactorily completed the requirements in practice teaching.

**Gymnasium Uniform.** The uniform consists of bloomers, tennis and gymnasium shoes, and middy blouse. *The physical director will order, after classification, the gymnasium shoes, blouse, and bloomers.* No other uniform will be accepted.

## Description of Studies

| Groups | Undergraduate |
|---|---|
| Physical Culture | 1[1], 2, 3, 4, 5, 6, 7, 8, 9, 12, 21, 24, 25, 26, 28 |

1. **Elementary Gymnastics.** Particular attention to the general carriage and physical condition of each student. Choice of tennis, basket ball, hockey, or golf; Swedish work, marching tactics, fancy steps, and games.

1st Sem. Lab. 2, 1 hr.; fee $2.00.

2. **Light Apparatus.** Wands, clubs, dumb bells; folk and American contra-dances. Choice of tennis or golf.

2nd Sem. Prerequisite 1; lab. 2, 1 hr.; fee $2.00.

3. **Apparatus.** Advanced movements that call for coördination, skill, and control on low buck, climbing ropes, ladders, flying and traveling rings, and stall bars. Choice of tennis, basket ball, hockey, or golf.

3rd Sem. Prerequisite 2; lab. 2, 1 hr.; fee $2.00.

4. **Heavy Apparatus.** Work on high buck horse, parallel bars, horizonal and serpentine ladders, traveling and flying rings, and giant stride. Choice of tennis or golf.

4th Sem. Prerequisite 3; lab. 2, 1 hr.; fee $2.00.

5. **Play and Playground.** Gymnastics; graded games; folk dancing; swimming. Prepares directors of organized play and athletics for home, rural, municipal and school playgrounds.

3rd Sem. Prerequisite 2, labs. 2, 1 hr; fee $2.00.

6. **Play and Playground.** Continuation of 5. Use and supervision of playground apparatus; base ball; basket ball; volley ball; practice teaching; writing simple play festival.

4th Sem. Prerequisite 5, lab. 2, 1 hr.; fee $2.00.

7. **Rhythmic Movements.** National, aesthetic, solo, and group dances. Choice of tennis, basket ball, hockey, or golf.

3rd Sem. Prerequisite 2; lab. 2, 1 hr.; fee $2.00.

*8. **Rhythmic Movements.** Continuation of 7. Choice of tennis or golf.

4th Sem. Prerequisite 7; lab. 2, 1 hr.; fee $2.00.

9. **Organization and Administration of Playgrounds.** Play and childhood; story telling; organization and practical conduct of municipal and rural recreation centers; playground equipment.

5th Sem. Prerequisite 2; lecture 1, lab. 2, 1 hr.; credit 1⅔; fee $2.00.

[1] The number refers to the description of the study.

* Students who wish to continue in 8 may apply to the Director and classes will be arranged for more advanced work.

**12 a, b, c, d. **Remedial Gymnastics.** Special attention to spinal curvatures, round shoulders, weak backs, narrow chests, broken arches and other physical defects and weaknesses. (Required of all students who have need of remedial work.)

1st, 2nd, 3rd, 4th Sem. Lab. 2, 1 hr.; fee $2.00.

21. **Community Festivals.** The festival in its educational, cultural, and recreational aspects.

5th Sem. Prerequisite P. C. 2, lab. 2; credit ⅔; fee $1.00.

24. **Corrective Gymnastics.** Common faults in posture and function of the spine, thorax, shoulder girdle, pelvis and feet. Students will practice individual corrective work with groups of children under supervision.

6th Sem. Prerequisite P. C. 2 and Zool. 112, or equivalent; lecture 1; lab. 2; credit 1⅔.

25. **General Gymnastics.** Linking of various forms of gymnastics, games, athletics, apparatus, dancing and festivals and demonstrating their importance. Advanced gymnastics.

7th Sem. Prerequisite P. C. 2; lab. 4; credit 2; fee $3.00.

26. **Methods and Practice Teaching in Gymnastics.** Equipment and text books; history of Physical Education. Theory and Practice teaching in the gymnasium and playgrounds.

8th Sem. Prerequisite P. C. 25; lecture 2; credit 2.

28. **First Aid and Physical Diagnosis.** First Aid will consider treatment necessary in case of emergency and accident; use of dressings, bandages and antiseptics. Physical Diagnosis will enable the student to recognize the prominent symptoms of heart and lung diseases, contagious diseases and the most common defects of ear and eye.

8th Sem. Prerequisite Zool. 150, or equivalent; lecture 2; credit 2; fee 50c.

## PHYSICAL TRAINING (For Men)

PROFESSOR WILLIAMS, Gymnasium, Room 202

Associate Professor Mayser; Assistant Professors Merriam, Walter, Rogers; Instructor Linden

*For information concerning the Division of Industrial Science, see page 76.*

The work in the department includes studies in personal hygiene, systematic gymnastic exercises, indoor and outdoor sports, including competitive athletics. The department is committed to the principle that its work should be mainly with the many rather than the few, and that the development of special teams is of secondary importance as compared with the development of the student body as a whole. Interclass and intercollegiate contests are deemed desirable under proper restrictions, but their importance is not exaggerated.

The Iowa State College is a member of the Missouri Valley Conference, and intercollegiate athletics are governed by the rules of this confer-

** Students assigned to 12 may take P. C. 1 or 2 if recommended by Physical Director.

ence. The College is also a member of the National Collegiate Athletic Association and is committed to tolerate only clean and wholesome sport and to promote good sportsmanship among contestants and spectators.

The regular work of the department consists of lectures on hygiene, physiology, anatomy, and kindred subjects; drill in marching, floor tactics, and class evolutions; class and individual drill in general calisthenics with and without apparatus, and mat exercises; class work in general indoor and outdoor athletics; corrective exercises for any who are defective physically; and, incidentally, specialized individual and team work in foot ball, basket ball, track, cross country, tennis, and wrestling.

A physical examination is required of all men taking work in the department.

Many requests are received for teachers in general and applied science who have had more or less physical training and work in athletics. Those who are preparing to teach may elect work specially adapted to their needs.

All indoor and outdoor athletic exercises are under the general direction of the department. All interclass and intercollegiate contests, and invitation meets and tournaments, when gate receipts are charged, are under the control of the Athletic Council.

**Track Work.** During the fall semester light work on track and field is carried on.

Freshman-Sophomore Meet: Special and systematic work on track and field.

Cross Country Running. Special training given includes walks and cross country work. A handicap meet, open to all, is run, and suitable trophies given the winners. A team represents the College in the Chicago and Missouri Valley cross country meets.

The leading interclass event of the second semester is the Home Meet. The intercollegiate events consist of one or more dual meets and the State meet; and the year's work culminates in the Missouri Valley track and field meet.

**Foot Ball.** Much attention and encouragement are given to interclass games. These are considered beneficial not only to the participants but also to the student body and College in general. Special training and coaching are given the team representing the College in intercollegiate games.

**Base Ball.** Interclass and department games are encouraged. Several diamonds are laid out on the campus, providing room for the many who care to follow this form of exercise. A splendid trophy in the form of a loving cup was donated by the class of '08 for the winner of the interclass championship.

**Basket Ball.** During the winter months basket ball is the leading competitive sport offered by the department. Besides the general exercise offered to all, class teams have their schedules and a team represents the College in intercollegiate games.

**Tennis.** Tennis courts are provided and cared for by the department.

These courts are open to all. Interclass schedules are played in the fall and spring; the spring contest is for the McKay tennis trophy—a beautiful and costly loving cup presented by Professor George L. McKay, formerly head of the Dairy Department of the College. One or more teams represent the College in intercollegiate tournaments.

**Equipment.** The department is well equipped for both indoor and outdoor work. The gymnasium recently completed is admirably adapted for its purpose. The main exercise floor is eighty feet by one hundred and seventy feet, without obstructions of any kind, and is twenty-four feet high. It is equipped with standard apparatus of the latest design, especially selected to secure the best possible results. The room is also equipped for basket ball, indoor base ball, volley ball, and hand ball, and has a gallery running track twelve feet wide and twelve laps to the mile. The lower floor is of dirt and is used for general exercise, field and track work, and team practice. The building is equipped with a swimming pool thirty feet wide and sixty feet long; there are general and team locker rooms with all the necessary bath and toilet facilities. It is well lighted, both naturally and artificially, and has forced ventilation throughout. In addition to the gymnasium, the department has at its disposal the new athletic field containing ten acres, directly south of the gymnasium; a playground to the north of the gymnasium of about equal area; and the old athletic field containing about seven acres. These fields are fitted out for foot ball, basket ball, soccer, tennis, track, and field work.

## Description of Studies

| Groups | Undergraduate |
|---|---|
| Physical Training | 1[1], 2, 3, 4, 5, 6 |

1. **Physical Training.** Personal Hygiene. Floor Tactics. Calisthenics. Gymnastics. Swimming. Outdoor and Indoor Games and Athletics. Efficiency Lectures.
1st Sem. Lab. 2, 1 hr.; required; fee $2.50.

2. **Physical Training.** Advanced work including first aid. Continuation of 1.
2nd Sem. Lab. 2, 1 hr.; required; fee $2.50.

3 **Physical Training.** Advanced work. Continuation of 2.
3rd Sem. Lab. 1, 1 hr ; required, fee $2.50.

4. **Physical Training.** Advanced work. Continuation of 3.
4th Sem. Lab. 1, 1 hr.; required; fee $2.50.

5. **Theory and Practice of Coaching.** Theory of Play. Sportsmanship. Rules. Training. Physiology. Anatomy. Hygiene. Actual Competition. Actual Coaching.
5th Sem. Lecture 1; lab. 2, 2 hr.; credit 2½.

6. **Theory and Practice of Coaching.** Continuation of 5.
6th Sem. Lecture 1 hr.; lab. 2, 2 hrs.; credit 2½.

[1] The number refers to the description of the study.

# PHYSICS

PROFESSOR SPINNEY, Engineering Hall, Room 212

Associate Professors Stiles, Thompson, Kunerth; Assistant Professor Plagge; Instructors Householder, Emery, *Neuswanger, Chrisler

*For information concerning the Division of Engineering, see page 50.*

This department occupies ten rooms on the first floor and five rooms on the second floor of Engineering Hall and nine rooms in Engineering Annex. These rooms include eight laboratories, six class rooms, and three apparatus rooms.

There are two lecture rooms, each of which has modern equipment for lecture purposes The apparatus provided includes two lanterns, a projectoscope and screens, gas, compressed air and water connections, and electric connections to storage batteries, and direct and alternating current dynamos. There is also a good equipment in other apparatus for demonstration purposes, which is stored in the physical cabinet and apparatus rooms.

The general laboratory rooms are large and well-lighted and are equipped with heavy oak tables, slate-top piers, and wall tables with heavy stone tops for the support of the laboratory apparatus. Convenient electric, gas, and water connections are provided. A very serviceable equipment in the apparatus used in general physical laboratory work is furnished.

The photometry and illumination rooms are equipped with several photometer benches furnished with gas and electric connections. The arrangement of apparatus is made with a view to facilitating the regulation tests of arc and incandescent lamps and other sources of illumination.

## Course in Industrial Science—Major Physics

For Freshman and Sophomore years, see page 246.

Students intending to major in Physics should continue mathematics during the Sophomore year and take Physics 303, 5 hrs., and Physics 404, 5 hrs., during the Sophomore year.

For general instructions as to Senior College work, see page 247.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Physics | 205[1], 303, 321, 330, 404, 422, 861, 865, 866 | 423, 426, 514, 523, 524, 525, 615, 617, 618, 619, 670, 708, 809, 507, 713, 810, 850, 868 | 1046, 1047 |

[1] The number refers to the description of the study.
* Absent on leave.

The following studies in this department have been omitted from the Catalogue for the period of the war: 406, 508, 511, 612, 816, 820, 1041, 1042, 1043, 1044, and 1045.

205. **Mechanics, Heat, and Light.** Fundamental principles of physics and their applications.

2nd Sem. Prerequisite Math. 17; lecture 1; recitation 1; lab. 1, 2 hrs.; credit 2⅔; fee $2.00.

303. **Mechanics and Heat.** Mass, force, work and energy, and power; general mechanics and heat; study of vector quantities and their treatment.

3rd Sem. Prerequisites Math. 40, 41, and 42; lectures and recitations 5; lab. 1, 2 hr.; credit 5; fee $2.00.

321. **General Physics.** Mass, force, work, energy, and power. Mechanics and heat.

3rd Sem. Prerequisite Math. 30; lectures 2; recitation 1; credit 3.

330. **General Physics.** Principles of mechanics, heat, electricity and its applications, sound, and light including color and illumination. For Home Economics students.

3rd Sem. Lectures 2; recitations 2; laboratory 1, 2 hr.; credit 5; fee $2.00.

404. **Electricity and Magnetism, Light and Sound.**

4th Sem. Prerequisite 303; lectures and recitations 5; lab. 1, 2 hr.; credit 5; fee $2.00.

422. **General Physics.** Light, electricity, and magnetism.

4th Sem. Prerequisite 321; lectures 2; recitation 1; credit 3.

423. **Physics Laboratory.** Mechanics, heat, and light.

4th Sem. Prerequisite 303, and classification in 404 and Math. 45; lab. 1, 3 hr.; credit 1; fee $3.00.

426. **Electricity and Magnetism.** Principles of electro-magnetism. Study of dynamos, motors, ignition and motor starting systems, etc.

4th Sem. Prerequisite 205; lectures and recitations 2; credit 2.

507. **Methods of Observation and Theory of Measurements.** Methods of grouping observations so as to obtain best results, probability, theory of errors.

5th Sem. Prerequisite 303, 404, Math. 45; lectures 1; lab. 1; credit 2.

514. **Physics Laboratory.** Mechanics, heat, and light, comprising accurate determinations of length, mass, time, density, energy, and moment of inertia, and also work in elasticity, calorimetry, photometry, and spectroscopy.

5th Sem. Prerequisites 303 and 404 and Math. 45; labs. 2, 3 hr.; credit 2; fee $5.00.

523. **Physics Laboratory.** Mechanics, heat, and light.

5th Sem. Prerequisites 303, 404, and Math. 45; lab. 1, 3 hr.; credit 1; fee $3.00.

524. **Heat.** Advanced.

5th or 7th Sem. Prerequisites 303 and 404, or 205; credit 3.

525. **Heat.** Laboratory accompanying 524.

5th or 7th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

615. **Physics Laboratory.** Similar to 617.

6th Sem. Prerequisite 514 or 523; lab. 1, 3 hr.; credit 1; fee $3.00.

617. **Physics Laboratory.** Measurements of current, resistance, electromotive force, capacity, and inductance. Earth's magnetism, magnetic

hysteresis and other magnetic properties of iron, and the efficiency of incandescent lamps at various voltages Insulation tests, instrument tests, battery tests, and the location of line faults. The electrolytic rectifier and other alternating current studies.

6th Sem. Prerequisites 514 or 523 and E E 506; labs 2, 3 hr ; credit 2, fee $5 00.

618. **Physical Optics.** Advanced

6th or 8th Sem Prerequisites 303 and 404; recitations 3, credit 3

619. **Physical Optics.** Laboratory accompanying 618.

6th or 8th Sem. Lab 1, 3 hr , credit 1; fee $3.00

670. **Industrial Physics.** Discussion of recent Physics research as applied to industrial problems Development of modern electric illuminants, X-Ray tubes, and wireless telephone. Increase in the efficiency of engines and heating devices, improvement in acoustic properties of auditoriums, etc.

6th or 8th Sem. Lectures and recitations 2, credit 2

708 **Illumination.** The physical basis of the production of light; light standards; methods of photometry and a comparison of commercial illuminants, including investigations of luminous efficiencies, color characteristics, and distribution of light The eye as an optical instrument, and the physiological and psychological aspects of illuminating engineering. Fundamental problems.

7th Sem. Prerequisites 404 and 514, or 523; lectures 2, lab 1; credit 3; fee $3

713. **Electricity and Magnetism.** Capacity, potential, current, resistance, magnetism, electromagnetic theory.

7th Sem Prerequisite 507 lectures and recitations 3, labs 2, credit 5; fee $5 00

809. **Illumination.** A continuation of 708, including the theory and use of the integrating photometer and the illuminometer. Design of interior and exterior illumination

8th Sem Prerequisite 708, lectures 2, lab 1, credit 3, fee $3 00

810. **Illumination.** The physical basis of the production of light, light standards, photometry, efficiencies, color and distribution characteristics, measurements of mean spherical candle-power and interior and exterior illumination

8th Sem Prerequisites 404 and 514, or 523, credit 3, fee $3 00

850. **Thesis.**

861. **Principles of Illumination.** A recitation-lecture course covering the fundamental principles of illumination and distribution of light. Units, problems, interior and exterior illumination.

6th or 8th Sem. Prerequisite 404; credit 2.

865. **Lighting the Home.** Light required in different rooms and for different kinds of work Use of globes, shades, reflectors. Effect of decorations and the color of various illuminants. Various kinds of interior illumination. Church and school lighting The eye as an optical instrument, and the effect of light on the eye both physiological and psychological. Efficiency and cost of different illuminants. Location of lamps and the different kinds of lamps.

8th Sem. Prerequisites 330 or 404, lectures or recitations 1; credit 1

866. **Illumination of Country Homes.** Consideration of the various kinds of light used; their characteristics, relative cost and operating expenses, efficiency of illuminants, and distribution of light.

8th Sem. Prerequisite 404; lecture and recitation 2; credit 2.

868. **Illumination.** Same as 809, but 2 hours instead of 3.

8th Sem Lecture 1; lab. 1; credit 2; fee $3.00

1046. **Research.**

1047. **Physics-Seminar.**

The amount of laboratory work and the number of recitations to be arranged

## PSYCHOLOGY

History and Psychology form one administrative department. For History, see page 213.

PROFESSOR CESSNA, Central Building, Room 212
Associate Professor Vance

*For information concerning the Division of Industrial Science, see page 76.*

Psychology is recognized as one of the essential sciences. The distinctive trend of modern psychology is toward the applied features of the science. The study of the facts and laws of mental life is, therefore, definitely related to the work of this institution. Every vocation that involves the human element must be based on the knowledge of the laws of mind. For this reason psychology is an essential factor in agricultural and engineering education, home economics, economics, history, the political and social sciences, manual training, scientific management, efficiency, etc. The rural uplift movements are essentially psychological.

The work includes a thorough course in elementary psychology. The other subjects deal largely with its application to the technical and applied sciences.

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate |
|---|---|---|
| Psychology | 7[1] | 6, 8, 10, 12, 13 |

NOTE: Psychology 7 and 8 (required) and 6 (elective) will count toward the state teachers' certificates. See State Teachers' Certificates.

The following studies in this department have been omitted from the Catalogue for the period of the war. 2, 3, and 11.

6. **Psychology of Childhood and Adolescence.** Characteristics of childhood and the critical changes of the adolescent period. The nature and treatment of instincts: individual, social, adaptive, environmental, regulative, and parental. Formation of habits: vegetative, social, moral, and religious. A study of adolescent organization: Boy Scouts, Girls' Campfire, the gang, athletics, cooking clubs, corn-judging contests, etc. The adolescent problem in rural uplift movements. The place of the parent in formal education: the home, study clubs, parent-teacher associations, etc.

5th, 6th, 7th, or 8th Sem Recitations 3; credit 3

[1] The number refers to the description of the study.

7. **Outlines of Psychology.** An introduction to the study of the normal adult human mind. A foundation for all the other studies in Psychology.

3rd, 4th, 5th, 6th, 7th, or 8th Sem. (Not open to Freshmen.) Recitations 3; credit 3.

8. **Educational Psychology.** A treatment of special phases of General and Genetic Psychology which are most applicable to education. The processes of adaptation: instinct, impulse, habit, and will; the applied psychology of perception, imagination, memory, association, attention, interest, simple feelings, emotions, and the higher thought processes; special problems: mental inheritance, the learning curve, individual differences, etc.

3rd, 4th, 5th, 6th, 7th, or 8th Sem. (Not open to Freshmen.) Prerequisite 7; recitations 3; credit 3.

10. **The Psychology of Business.** Main facts and laws of mind and their application to business-life. Advertising and salesmanship: attention, memory, suggestion, the feeling and emotions, the direct command, the value of the return coupon, large and small spaces; influencing men in business; practical applications. Handling of men: individual and group efficiency, interest, habit, attitude, motion-study, the psychology of the crowd, the strike, wages, piece-work, task and bonus; scientific management; the new efficiency movements; the human elements in efficiency—"the man behind the machine."

5th, 6th, 7th, or 8th Sem. Recitations 2; credit 2.

12. **Social and Ethical Teachings of the Prophets.** The political, social, and religious development of the Hebrew people, showing their place in the history of nations and their contribution to modern institutions and thought. The influence of the social practice and the idealism of great personalities. The messages of the prophets and the sages.

3rd, 5th, or 7th Sem. Recitations 2; credit 2.

15. **Social and Ethical Teachings of Jesus.** An historical study of the social, ethical, and religious ideals of the early years of the Christian era. The life and times of Jesus. An attempt to apply the principles of modern, constructive, historical methods to the study of the New Testament history. The messages of Jesus and his Apostles.

4th, 6th, or 8th Sem. Recitations 2; credit 2.

## PUBLIC SPEAKING

PROFESSOR SHATTUCK, Central Building, Room 311½
Instructors Kauffman, Hulbert

*For information concerning the Division of Industrial Science, see page 76.*

It is the purpose of the department to give technical students criticism and practice in public speaking. Much of the work is individual, preparing students in the delivery of their debates, orations, readings, plays, and in other public performances.

The Public Speaking Department is well equipped for the work of practical and effective public speaking. There are two large recitation

rooms with platforms and speakers' stands and capable of seating from forty to fifty students. In addition to this there is one large room known as Recital Hall. This room is available for student recitals and other public speaking events conducted by the department from time to time. There has been built up a splendid public speaking library composed of all the books available in the speech arts. A fine list of selections for recitations may be found on file in the main office of the department.

## Description of Studies

| Groups | Undergraduate |
|---|---|
| Public Speaking | 2[1], 3, 4, 5, 8, 10, 11, 15, 16, 19, 20 |

The following study in this department has been omitted from the Catalogue for the period of the war: 6.

2. **The Fundamentals of Public Speaking.** To help the student get command of himself. Attention is especially given to voice building and expression.

1st or 2nd Sem. Recitation 1; credit 1.

3. **Interpretation.** Methods of vocal interpretation, criticism, and delivery. Besides the class lectures and class exercises on topics pertaining to interpretation and delivery, each student is instructed privately and personally at stated intervals throughout the semester.

5th or 6th Sem. Prerequisite 2 or its equivalent; recitations 2; credit 2.

4. **Interpretative Analysis.** Character study, dramatic and analytical interpretation. Methods of analyzing, clipping, and arranging stories and other literary forms. Students are met for private rehearsals and criticisms.

5th or 6th Sem. Prerequisite 3; or admission upon recommendation of the instructor in charge; recitations 2; credit 2.

5. **The Lecture Recital.** How to select, introduce, and arrange selections for the lecture recital; the art of preparing and arranging a recital from a play or work of fiction. It is presupposed that the student has some dramatic ability.

5th or 7th Sem. Prerequisite 4; recitations 2; credit 2.

8. **Orations and Orators.** Prepared and formal address, such as orations and speeches for special occasions. Historical masterpieces and winning orations studied. At least one oration required of each student during the semester.

3rd or 4th Sem. Recitation 1; credit 1.

10. **Extempore Speech.** To develop the power of sincere and effective public speaking. The fundamental principles of speech organization and delivery studied according to the true extemporaneous method. The assimilation of the essentials of effective speaking and the working out of these essentials into actual practice before the audience. Each student is given the opportunity to appear in an original speech before his fellow students at least once every week or ten days.

3rd, 4th, 5th, 6th, or 7th Sem. Recitations 2; credit 2.

[1] The number refers to the description of the study.

11. **Extempore Speech.** Same methods as 10, although advanced. Lectures; each student is given the opportunity to appear before the class in a short address every week or ten days.

**4th, 5th, 6th, 7th, or 8th Sem. Prerequisite 10; recitations 2; credit 2.**

15. **Public Speaking.** To prepare women for domestic science demonstration work, and to fit them to appear in public before women's clubs, institutes, and other organizations. Practice in the organizing and delivering of speeches before the student audience, under the helpful criticism of the teacher. Each student required to appear before the class in an original speech once every week or ten days.

**6th, 7th, or 8th Sem. Recitations 2; credit 2.**

16. **Advanced Public Speaking.** For the training of those students who wish to prepare themselves for institute speaking or for other public speaking which should require special training and equipment.

**5th, 6th, or 7th Sem. Prerequisites 10 and 11; recitation 1; credit 1.**

19. **Extempore Speech.** For engineering students.

**5th or 6th Sem. Recitation 1; credit 1.**

20. **Debating.** Training in platform presentation. Open to debaters who have succeeded in making the intercollegiate debating teams

**Both semesters. Prerequisite English 412, or its equivalent; credit 3**

## SOILS

(SUB-DEPARTMENT OF FARM CROPS AND SOILS)

For description of studies, see page 191.

## STRUCTURE DESIGN

(Now "Architectural Engineering and Rural Structures." See page 110.)

## VETERINARY MEDICINE

For general statement concerning organization, etc., of the Division of Veterinary Medicine, see page 78.

### Course in Veterinary Medicine

Leading to the degree of Doctor of Veterinary Medicine.

FRESHMAN YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Vet. Anat. 101[1]: Osteology and Arthrology | 4 | Vet. Anat. 202: Myology and Splanchnology | 5 |
| Vet. Anat. 133: Microscopy and Microscopic Anatomy | 3 | Vet. Anat. 234: Microscopic Anatomy of the Organs | 3 |
| A. H. 26: Market and Breed Types of Beef Cattle and Sheep | 2⅓ | A. H. 27: Market and Breed Types of Dairy Cattle, Horses and Swine | 2⅓ |

[1] The number refers to the description of the study
[2] For definition of a credit see page 81.

| | | | |
|---|---|---|---|
| Bot. 109: Structural Botany | 3 | Chem. 408: Bio-Chemistry | 5 |
| Chem. 111: General Chemistry | 5 | Engl 325: Vet. English | 1 |
| Mil. Sci. 1: Military Art | 1 | Lib. 5: Library Instruction (4 hrs. for semester) | R |
| Phys. Tr. 1 | R | Mil. Sci. 2: Military Art | 1 |
| | | Phys. Tr. 2 | R |
| | 18⅓ | | 17⅓ |

SOPHOMORE YEAR

Third Semester

| | Credits |
|---|---|
| Vet Anat. 303: Myology, Angiology, Neurology | 5 |
| Vet Path. 350: General and Pathogenic Bacteriology | 6 |
| Vet. Phys. 322: Comparative Physiology | 4 |
| Mil. Sci 3· Military Art | 1 |
| Phys. Tr. 3 | R |
| Zool. 15· General Zoology | 3 |
| | 19 |

Fourth Semester

| | Credits |
|---|---|
| Vet. Anat. 404: Comparative Anatomy | 6 |
| Vet. Path. 435: General Pathology | 5 |
| Vet. Phys. 424: Comparative Physiology | 4 |
| Mil. Sci. 4· Military Art | 1 |
| Phys Tr. 4 | R |
| Zool 247· Embryology | 3 |
| | 19 |

JUNIOR YEAR

Fifth Semester

| | Credits |
|---|---|
| Vet. Path. 536: Special Pathology | 4 |
| †Vet Phys. 525: Pharmacy | 2⅔ |
| Vet. Phys. 527: Materia Medica | 2 |
| Vet. Theo Pr. 505: Practice and Diagnosis | 5 |
| Vet. Surg. 550: Clinics | 3 |
| †Mil. Sci. 9· Military Art | 1 |
| †A. H. 20: Animal Feeding | 2 |
| | 19⅔ |

Sixth Semester

| | Credits |
|---|---|
| Vet. Path 637: Animal Parasites | 3 |
| Vet. Phys. 634: Therapeutics | 4 |
| Vet. Theo. Pr. 606: Practice and Diagnosis | 4 |
| †Vet. Surg. 651: Clinics | 3 |
| Vet. Surg. 626: General Surgery and Surgical Technique | 4 |
| †Mil. Sci. 10: Military Art | 1 |
| | 19 |

Electives:

| | |
|---|---|
| Bot. 516: Poisonous Plants | 2 |
| Dairy 29: Milk Testing | 1⅔ |
| A. H. 8: Animal Breeding | 2 |

[1] R indicates that the study is required, without credit, for graduation.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270. Laboratory only of Vet. Phys. 525 may be omitted.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Vet. Path. 739: Food Hygiene | 2 | Vet. Path. 860: Immunity and Serum Therapy | 2 |
| Vet. Surg. 720: Obstetrics | 3 | Vet. Surg. 828: Special Surgery | 5 |
| Vet. Surg. 727: Special Surgery | 5 | Vet. Theo. Pr. 808: Infectious Diseases and Sanitation | 5 |
| Vet. Theo. Pr. 707: Infectious Diseases and Sanitation | 4 | Vet. Surg. 853: Clinics | 4 |
| Vet. Surg. 752: Clinics | 4 | †Mil. Sci. 12: Military Art | 1 |
| †Mil. Sci. 11: Military Art | 1 | Econ. Sci. 325: Veterinary Law | 1 |
| | 19 | | 18 |
| Electives: | | Electives: | |
| Vet. Anat. 705: Applied Topographic Anatomy | 2 | Vet. Path. 838: Advanced Path. | 2 |
| Psych. 11: The Animal Mind | 2 | Vet. Phys. 835: Therapeutics | 1 |
| Pub. Sp. 10: Extempore Speech | 2 | Vet. Path. 862: Lab. in Immunity and Serum Therapy | 1 |

### Course in Science and Veterinary Medicine

Administered jointly by the Dean of the Division of Industrial Science and the Dean of the Division of Veterinary Medicine. For plan of course of study, see page 249.

### Course in Animal Husbandry and Veterinary Medicine

On account of a demand for a course offering degrees in both Animal Husbandry and Veterinary Medicine, a combined course has been outlined so that the student pursuing this course may receive both degrees in six years. Students desiring to enter this course should inquire of the Dean of the Junior College for further information.

### Short Course for Practitioners in Veterinary Medicine

The Legislature has provided a special fund for courses of instruction for practitioners. During the summer a course of at least one week will be offered and this will be supplemented as opportunity may afford. It will include lectures and demonstrations covering some of the newest developments in the science of veterinary medicine. It is proposed to arrange the course so that practitioners may spend a few days at Ames and get the latest and best that is being made available in any state or country. At the same time, there will be a rapid review of some phases of veterinary medicine with reference to the needs of practitioners. A special announcement of this course will be sent on application to the Dean of the Division of Veterinary Medicine.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

## VETERINARY ANATOMY

PROFESSOR MURPHEY, Anatomy Building, Veterinary Group, Room 117
Assistant Professor Grossman; Instructors Drs. Leith, Hewitt; Fellow *Brashier; Technicians Carey, Beckman

*For information concerning the Division of Veterinary Medicine, see page 78.*

The Department of Anatomy is organized to give instruction in all phases of anatomy to students in either Veterinary Medicine or Animal Husbandry. The laboratories are well equipped. In Histology and Osteology each student is assigned an individual desk provided with a microscope, 100 permanent mounts of tissue, laboratory notes, and one-half skeleton of disarticulated bones of the horse. The dissecting room is modern, sanitary, and well equipped. All cadavers are preserved. Students in Animal Husbandry should have a general knowledge of anatomy as preparation for their work in nutrition and stock judging. Veterinary students should have a detailed knowledge of the structure of the domestic animals and birds to understand properly Physiology, Pathology, Diagnosis, Surgery, and Medicine.

The following methods are used in teaching Anatomy: didactic instruction; quiz; specimen demonstration; specimen study; lantern slide demonstrations; dissection; the use of the living horse for palpating and outlining the structures. No small part of the value of a course in Anatomy for the veterinary student is to learn the scheme of scientific terminology and to be able to make observations in the laboratory, also to get a correct viewpoint for his future problems which arise in the pursuance of associated subjects. A large and well selected number of specimens and lantern slides are used in the class and laboratory demonstrations to emphasize the most important structures and their relations from a clinical standpoint; these are also available for student use. An opportunity is thus given to study the anatomy of the horse, ox, sheep, dog, pig, and chicken.

Students in Industrial Science desiring to major in Veterinary Anatomy, see page 246 for Freshman and Sophomore year; and for general instruction as to Senior College work, see page 247.

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Gross Anatomy | 355[1] | 101, 202, 303, 404 | 1010 |
| Microscopic Anatomy | | 133, 234, 705 | 1011 |

101. **Osteology and Arthrology.** Structure and classification of bones in general; bones of the horse in detail. Emphasis placed on "sculpture" as related to other structures, e. g., muscular and ligamentous at-

* Resigned February 1, 1918.
[1] The number refers to the description of the study.

tachments, nerve and vessel conduits. Articulations in general; articulations of horse; bones sketched in laboratory.

1st Sem. Recitations 3; lab. 3 hr.; credit 4; fee $1 00.

133. **Microscopy and Microscopic Anatomy** (Normal Histology). Theory, use, and care of the microscope, and the simple and standard methods of fixation; staining and mounting cells, tissues, and organs. The cell and tissues in general; classification and description of the cells and tissues of the body; an outline of histogenesis.

1st Sem. Lecture 1; lab. 6 hrs.; credit 3; fee $5.00.

202. **Myology and Splanchnology of the Horse.** Demonstrations; complete dissection of horse; systemic anatomy of muscles, digestive, respiratory, and genito-urinary systems. Special attention in laboratory to fascial compartments, joint pouchings, vaginal sheaths, bursæ and their topography. Splanchnology is taken up first in the class work which also covers the Microscopic Anatomy (coördinating with 234) Color, consistency, morphology, relationships.

2nd Sem Prerequisite 101, recitations 2 lab 9 hrs ; credit 5, fee $4 00

234. **Microscopic Anatomy of the Organs of the Domestic Animals.** A detailed study from a morphological and comparative standpoint; the structural changes during different phases of physiological activity The comparative amounts of parenchyma and supporting tissue noted.

2nd Sem. Prerequisite 133; lecture 1, lab 6 hrs , credit 3, fee $3.00.

303 **Myology, Angiology, Neurology.** Class work the systemic anatomy of the muscles, fascial compartments, heart and blood vessels, lymph nodes and lymph vessels, and the nervous system Topography is included where it seems desirable Laboratory work a second dissection and specimen study of the horse from a topographic view point; the systemic anatomy is reviewed.

3rd Sem. Prerequisites 101, 202, 133, and 234, recitations 3, lab 6 hrs , credit 5 hrs.; fee $4 00.

355. **Anatomy of Domestic Animals.** (For Animal Husbandry students.) Structures of the animal body as related to function and form. The skeleton, articulations, muscles. The digestive, respiratory, and genito-urinary organs of the horse, ox, pig, and chickens The dissection work will be arranged to meet the demands of those specializing along dairy and poultry husbandry lines.

3rd Sem. Lecture 1; lab. 6 hrs.; credit 3, fee $4.00

404. **Comparative Anatomy.** Continuation of 303. Finish second dissection of horse, dissect in addition the ox, sheep, pig, dog, and chicken. Superficial structures; digestive, respiratory, lymphatic, and genito-urinary systems in particular. The special features of physiological, pathological, clinical, and surgical importance are emphasized; microscopic anatomy reviewed in class work.

4th Sem Prerequisite 303, recitations 3; lab. 9 hrs , credit 6; fee $4.00.

705. **Applied Topographic (Surgical and Clinical) Anatomy.** A

lecture-demonstration subject for Senior students. Specimens, lantern slides, dissections before the class, and living animals will be used.

7th Sem. Prerequisites Vet. 404,. 606, 626, and 651. Lecture 1; lab. 1, 3 hr.; credit 2.

1010. **Research in Anatomy.** Problems of importance relative to Animal Husbandry, Veterinary Physiology, Pathology, or Surgery. Anatomical problems of a systemic, topographic, or comparative nature.

PROFESSOR MURPHEY

Lab. 3 or 4; credit 3 or 4.

1011. **Research in Microscopic Anatomy.** Physiological histology; comparative work dealing with problems of importance to pathology, or with anatomical problems relating to histogenesis or morphology.

PROFESSOR MURPHEY

NOTE: 101, 202, 303, 404, 183, and 234 are offered as graduate subjects to Animal Husbandry and Industrial Science students.

## VETERINARY PATHOLOGY AND BACTERIOLOGY

PROFESSOR DIMOCK, Pathology Building, Veterinary Group, Room 113
ASSOCIATE PROFESSOR RICE, Room 112
Instructor Steiner

*For information concerning the Division of Veterinary Medicine, see page 78.*

The Department of Pathology and Bacteriology occupies the northeast building of the veterinary group. This building was planned and arranged for the work given in this Department. Two offices open directly into a private laboratory which is used by the men in charge to investigate problems pertaining to their lines of work. A large general laboratory faces the north and has windows on three sides, supplying the best possible light for microscopic work. It has capacity and individual equipment for a section of thirty students. Each desk has a plate glass top, making possible the perfect sanitary conditions necessary in handling infectious material. The desks are supplied with gas lamps, microscopes, and accessories necessary for carrying on work in both pathology and bacteriology. In connection with the laboratory are two preparation rooms, one devoted to work in pathology, the other in bacteriology. The pathology preparation room is equipped with all the necessary apparatus for fixing, embedding, sectioning, staining, and mounting tissues. The bacteriology preparation room is equipped with sterilizers and other apparatus necessary for the preparation of media and carrying on of bacteriological work. The incubator room is centrally located adjacent to the main laboratory. A class room which will accommodate fifty students occupies the remaining space on this floor. Here provision is made for lantern slide and microscopic projection work.

In the basement are six rooms devoted to the housing of small animals, to inoculation and post mortem work, to the preparation of museum specimens, and to the storing of museum specimens used in the demonstration work in the various studies offered in this department.

The work of the Department is outlined so that the principles of path-

ology and bacteriology are dealt with as a science, and as applied to veterinary medicine. The aim of the work is to give the student such training that when he meets a particular case he may know whether the symptoms shown indicate a general or a specific pathological change in certain of the body organs; for not until the cause and tissue changes underlying the indication are understood can an accurate diagnosis be made or treatment successfully applied.

### Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Pathology | 637[1], 739, 871 | 435, 536, 838 | 1020 |
| Bacteriology | 350, 744 | 860, 862 | 1025 |

350. **General and Pathogenic Bacteriology.** Same as Bact. 50. Morphology, classification, cultivation, and physiological characters of bacteria; the preparation of plain and special media; the principles of infection and contagion; discussion of the various theories of immunity as related to bacterial infection; methods of producing immunity.

3rd Sem. Recitations 4; labs. 2, 3 hr.; credit 6; fee $5.00.

435. **General Pathology.** Causes of diseases, their spread and generalization, fever, protective and healing forces, disturbances of circulation; retrograde disturbances of nutrition and infiltration, hypertrophy and regeneration, inflammation and tumors. Fixed and stained microscopical preparations showing the various pathological phenomena. Preparation and preservation of gross specimens, preparation of sections for microscopical study, and general technique of laboratory diagnosis.

4th Sem. Prerequisites 350, Vet. Anat. 133 and 234; recitations 3; lab. 2, 3 hr.; credit 5; fee $4.00.

536. **Special Pathology.** Causes, morbid anatomy, and morbid histology of the principal organic diseases, including both specific and nonspecific conditions; diseases of the blood and circulatory organs, digestive apparatus, spleen, lymph glands, muscles, bones, tendons, bursæ and ligaments, the nervous system and the cutis.

5th Sem. Prerequisites 435, Vet. Anat. 101 and 202; recitations 3; lab. 1, 3 hr.; credit 4; fee $5.00.

637. **Animal Parasites.** A classification, study of the life history, anatomy and morphology for identification, and mode of infestation of those parasites injurious to domestic animals, together with a study of the lesions produced as a result of their presence upon or within the animal body.

6th Sem. Prerequisite Zool. 15; recitations 2; lab. 1, 3 hr.; credit 3; fee $2.00.

739. **Food Hygiene.** Designed to cover the field of meat and milk inspection in the broadest sense. The work in meat inspection is based in general on the requirements of the meat inspection service of the United States, but especial effort is made to render the work applicable to mu-

[1] The number refers to the description of the study.

nicipal and rural districts in order that the student may be trained to meet the growing demands in this line of work, and in milk inspection to familiarize the student with all conditions which may be responsible for an injurious or unwholesome milk. Particular attention given to the effect of pathological conditions of the udder upon the quality of the milk.

7th Sem. Prerequisite 435 and 350; recitations 2; credit 2.

744. **Farm Sanitation and Communicable Diseases.** (For Agricultural students.) General consideration of the causes of disease and manner of spread; disinfectants and their application; general hygiene and stable sanitation, including drainage and selection of site.

7th Sem. Prerequisite Bact. 1 or 15; recitations 3; credit 3.

838. **Advanced Pathology.** (Elective.) The work given will be of an advanced character dealing with certain phases of pathology not possible to take up in studies 435 and 536. Especial emphasis will be put on the pathology of the more important specific infectious diseases; the tissue changes resulting from secondary and mixed infections; inflammation and, so far as possible, the chemical changes taking place in pathological processes.

8th Sem. Prerequisites 435 and 536; lectures 2; credit 2.

860. **Immunity and Serum Therapy.** Same as Bact. 60. Theories of immunity and immunization; preparation of bacterins, vaccines, and antisera; serum tests in the diagnosis of disease.

PROFESSOR MURRAY; ASSOCIATE PROFESSOR RICE

8th Sem. Prerequisite 350; recitations 2; credit 2.

862. **Laboratory in Immunity and Serum Therapy.** Same as Bact. 62. Supplementary to 860 and elective to students taking 860.

8th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

871. **Poultry Parasites, Diseases, and Hygiene.**

8th Sem. Recitations 2; credit 2.

1020. **Research in Pathology.** (a) Systemic pathology. (b) The pathology of specific infectious diseases. (c) The pathology of sporadic diseases. (d) Tumors. (e) Chemical pathology. PROFESSOR DIMOCK

Prerequisites 350 and 536 or their equivalent.

1025. **Research in Bacteriology.** (a) Veterinary bacteriology. (b) Immunity. (c) Serum therapy.

PROFESSOR MURRAY; ASSOCIATE PROFESSOR RICE

Prerequisite 350 or its equivalent.

**Post Mortem Work.** The object of this work is to demonstrate the procedure and technique in holding post mortem examinations, to observe and interpret lesions as seen in the gross, to help the student connect the morbid anatomy with the clinical symptoms and to carry out such procedure as will help to explain the cause of death and thus determine the correct diagnosis. This work is conducted in coöperation with the Department of Theory and Practice and Surgery, and is supplementary to Pathology 536 and all phases of clinical work. See 312.

## VETERINARY PHYSIOLOGY AND PHARMACOLOGY

PROFESSOR BERGMAN, Physiology Building, Veterinary Group, Room 100
Instructor Judisch; Fellow Orr; Student Assistant Young

*For information concerning the Division of Veterinary Medicine, see page 78.*

The southeast building of the Veterinary group is devoted to the work in Physiology, Pharmacy, Materia Medica, and Therapeutics. This building was planned for the investigation and teaching of physiological and pharmacological subjects; and the laboratories, demonstration and class rooms are admirably arranged and equipped for the pursuance of general or research work along these lines.

In the general laboratories, students are provided with individual equipment as far as possible, and thus self reliance is stimulated and individual responsibility developed. The laboratories have been newly equipped and are thoroughly up to date in all respects The latest apparatus for practical physiological, pharmacological, or pharmaceutical demonstration and laboratory work is available.

Before attempting a proper conception of diseased conditions it is necessary to have a complete understanding of the normal functions of the body structures. The purpose of the work offered in Physiology is to point out and make a detailed study of all the topics which will be of the greatest use to the student in comprehending the vital phenomena occurring normally in the animal body. The work is presented in the form of lectures, recitations, demonstrations, and practical laboratory work in which the chemical and physical processes of the animal body are considered, the various systems, organs, and their functions being taken up in logical order. The lecture work is supplemented by the use of dissected specimens, practical demonstrations, and drawings. A large part of the laboratory work is devoted to the study of the phenomena of the respiratory, circulatory, muscular, and nervous systems; also to the various phases of digestion and absorption, and the circulating fluids of the body.

As Pharmacy and Materia Medica are prerequisite to Therapeutics, these subjects are considered in the order named; the work is presented as lectures, recitations, laboratory work, and pharmacological demonstrations. In the presentation of the work in Therapeutics, numerous clinical observations of the application of the various therapeutic methods are made. The easy access to the Veterinary Hospital where clinical cases and also experimental animals are available, makes this phase of the work very practical.

Students in Industrial Science desiring to major in Veterinary Physiology, see page 246 for Freshman and Sophomore year; and for general instructions as to Senior College work, see page 247.

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| Physiology | 22[1] | 322, 424 | 1001,1002, 1005 |
| Pharmacology | 525, 527, 634, 835 | | |

22. **Comparative Physiology.** (For agricultural students.) Physiology of the blood and lymph, the organs of circulation, ductless glands, functional activity of the digestive tract, and the organs of elimination of the body, as related to nutrition.

5th Sem. Prerequisite Vet. Anat. 355; lectures and recitations 2; credit 2.

322. **Comparative Physiology.** The animal cell, the unit of organization; its origin, modifications of form, and specialization of function in the different tissues, and the various chemical and physical phenomena which affect its nutrition, development, and reproduction; muscle, the muscular system; the respiratory system; blood and lymph, and the organs of circulation, including a consideration of the associated gases.

3rd Sem. Lectures and recitations 3; lab. 1, 3 hr.; credit 4; fee $2 00.

424. **Comparative Physiology.** Digestion, secretion, absorption, the ductless glands, metabolism, nutrition, animal heat, nerves, central nervous system and senses, reproduction.

4th Sem. Lectures and recitations 3; lab 1, 3 hr; credit 4; fee $2 00

525. **Pharmacy.** Processes and principles, official drugs, chemicals and proximate principles, their solubility and incompatibility Preparation of each of the official preparations; toxicology Prescription writing and pharmaceutical arithmetic.

5th Sem. Recitations 2; lab. 1, 2 hr; credit 2⅔, fee $2 00.

527. **Materia Medica.** Definitions and discussions of the composition of drugs, classifications, official preparations, incompatibilities, combinations, and the form of administration. Numerous pharmacological demonstrations.

5th Sem. Recitations 2, credit 2.

634. **Therapeutics.** Modes of action of drugs, the physiological laws governing them; absorption, elimination, methods and time of administration; posology; incompatibilities; prescription writing The different systems and organs of the animal body, and the drugs influencing them; physiological actions of drugs and their therapeutic value; indications, contra indications, and toxicology of each therapeutic agent; general therapeutic measures.

6th Sem. Prerequisites 525 and 527; credit 4

835. **Therapeutics.** A continuation of 634, with the practical side particularly emphasized, the work being selected and especially arranged to meet the needs of Senior veterinary students planning upon entering active practice.

8th Sem. Prerequisite 634; lecture 1; credit 1.

[1] The number refers to the description of the study.

1001. **Comparative Physiology.** Minor graduate work especially arranged to meet the needs of graduate students in agriculture, doing their major work along such lines as general nutrition, meat or milk production problems, animal feeding, breeding, etc. The work may be selected and the laboratory and time requirements arranged by consultation with the head of the department. PROFESSOR BERGMAN

1st Sem.

1002. **Comparative Physiology.** Continuation of 1001, including considerable individual conference work, and biweekly meetings of graduate students to discuss especially assigned topics. PROFESSOR BERGMAN

2nd Sem.

1005. **Research in Physiology.** An opportunity for investigation work in physiological subjects relative to veterinary science is offered to a limited number of students who have had such prerequisite work as may be essential to its pursuance. The selection of work and the amount of time required are arranged, in each case, by consultation with the head of the department. PROFESSOR BERGMAN

## VETERINARY SURGERY

PROFESSOR *BEMIS, Administration Building, Veterinary Group, Room 108

PROFESSOR MURPHEY, Acting Head of the Department

Assistant Professor and House Surgeon Dr. *Guard; Pharmacist Anderson

*For information concerning the Division of Veterinary Medicine, see page 78.*

The Department of Surgery is especially well equipped for making its teaching both practical and scientific. The Clinic and Hospital Building in which the work of this department is carried on, occupies the west central portion of the Veterinary group of buildings. The hospital is ample for all needs, being 160 feet long by 60 feet wide and having a stall capacity for 42 large animals, 22 dogs, and other small animals. For clinics, the hospital contains three operating rooms. The largest, 65 by 30 feet, opens on the interior court and is used for examining animals as they are admitted, and for minor operations and treatment. Joining it is a clinical amphitheater; next to this is the third operating room for large animals, equipped with a hydraulic operating table, X-ray apparatus, and other operating room conveniences. Between the operating room and clinic room is a dispensary and instrument room. On the upper floor, near the kennels, is a small animal operating room equipped with white enamel furniture; also operating instruments and modern steam sterilizers for water, instruments, and dressings.

During the school year seven or eight hundred surgical cases, including a wide range of conditions, are operated upon and treated at the hospital, each case being assigned to a Senior student with one or more Junior assistants. All operations are performed by the professors in charge, and

* On leave of absence for military service.

the after treatment is always under their direction, the idea being that the clinical cases are in no way experimental, but that they shall be treated as similar cases are to be treated later in practice.

All the class room work in surgery is conducted in the amphitheater in the hospital building, where animals affected with conditions under discussion as well as instruments and apparatus to be used in diagnosis, treatment, or restraint, can be brought before the class. Clinic cases are constantly used to correlate the theoretical and the practical.

## Description of Studies

| Groups | Undergraduate | Graduate |
|---|---|---|
| Surgery | 626[1], 727, 828 | 1029 |
| Soundness | 17 | |
| Obstetrics | 19, 720 | |
| Clinics | 550, 651, 752, 853 | |

17. **Soundness and Shoeing.** (For Agricultural students.) Common unsoundnesses of the horse. Anatomy and physiology of the foot; factors affecting the style of going; preparation of the foot for going barefoot, and for the shoe; special-purpose shoeing, and pathological shoeing.

8th Sem. Prerequisite, Vet. Anat. 355; recitations 2; credit 2.

19. **Obstetrics.** (For Agricultural students.) Anatomy and physiology of the genital organs of the male and female, ovulation, oestrum, fecundation, gestation, sterility, hygiene of pregnant animals, and care of new born animals.

7th Sem. Prerequisites, Zool. 231, Vet. Anat. 355, and Vet. Phys. 22; recitation 1; credit 1.

550. **Clinics.** Making daily examinations; dressing wounds; daily treatment of the hospital cases. Assisting pharmacist in the compounding of prescriptions. Assisting in post mortem examinations.

5th Sem. Prerequisite same as 626; labs. 5, 2 hr.; credit 3.

626. **General Surgery and Surgical Technique.** Wound dressing, sutures and suturing, anæsthesia, antisepsis; treatment of inflammation, diseases of bones, muscles, nerves, articulations, tendons, tendon sheath, surgical diagnosis and lameness.

6th Sem. Prerequisite: first two years of Vet. Course; recitation 4; credit 4.

651. **Clinics.** Continuation of 550.

6th Sem. Labs. 5, 2 hr.; credit 3.

720. **Obstetrics.** Physiological obstetrics; ovulation, œstrum, fecundation, gestation, sterility, hygiene of pregnant animals, and care of new born. Especial attention is given to the subject of sterility, its causes and treatment. Diseases of, and accidents due to pregnancy; obstetrical operations; the sequelæ of parturition; diseases of the young animal. The ambulatory clinic renders many cases from the College farm and surrounding country available for the practical work in this subject.

7th Sem. Prerequisites, Vet. Anat., Vet. Phys. and Zool. 247; recitations 3; credit 3.

[1] The number refers to the description of the study.

727 **Special Surgery.** Diagnosis and treatment of the surgical diseases of the various regions of the body. Taught by recitations, demonstrations, and surgical exercises in which the student performs all the important surgical operations upon anæsthetized animals. Principles and practice of shoeing included when discussing diseases of feet and limbs.

7th Sem Prerequisite 626, recitations 4; lab. 1, 3 hr.; credit 5.

752. **Clinics.** The cases brought to the hospital for treatment are assigned to Senior students, who are required to prepare a full report of their examinations, diagnosis, and proposed treatment They are required to confine animals for operations and assist the clinical professor during surgical procedure, and to hold post mortem examinations under the direction of the pathologist

7th Sem Prerequisite Vet Theory and Pr 550 and 651, labs 6, 2 hr, credit 4.

828. **Special Surgery.** Continuation of 727.

8th Sem Recitations 4, lab 1, 3 hrs, credit 5

853. **Clinics.** Continuation of 752.

8th Sem Labs 6, 2 hr, credit 4

1029. **Research in Surgery.** Special problems connected with surgical conditions, surgical technique, and sterility of animals PROFESSOR BEMIS

Lab 2 or 3 hr, credit 2 or 3

## VETERINARY THEORY AND PRACTICE

PROFESSOR STANGE, Administration Building, Veterinary Group, Room 106
Assistant Professors Bolton, *Nelson, **Covault

*For information concerning the Division of Veterinary Medicine, see page 78.*

In the study of Theory and Practice it is necessary for the student to summarize and apply the training received previously in Anatomy, Physiology, Bacteriology, Pathology, and Therapeutics. The work is given in the form of lectures and clinical demonstrations. The near-by towns and surrounding farms furnish an abundance of material. When cases cannot be brought before the classes, the students are taken to the farms and given actual practice in diagnosis and treatment of cases.

The Clinic presents a great variety of cases representing all classes of animals kept on the farm, and the opportunity to observe the animals under natural farm conditions has proved a decided advantage over a city clinic.

### Description of Studies

| Groups | Undergraduate |
|---|---|
| Practice and Diagnosis | 505[1], 606 |
| Infectious Diseases and Sanitation | 707, 808 |
| Clinics | 550, 651, 752, 853 |

[1] The number refers to the description of the study
* On leave of absence for military service
** Appointed January 1, 1918

505. **Practice and Diagnosis.** The subject consists of two parts:

(a) Physical Diagnosis begins the study of Theory and Practice. The application of the methods of examination of animals is emphasized and demonstrated. Each student is required to make physical examinations of the different organs and systems of animals. Clinical cases are utilized so far as possible; healthy animals are used to show normal conditions; and diseased animals are used in comparison to show the variations from the normal or healthy condition. The student is hereby prepared for work in the Clinics, where his ability to read symptoms and make diagnosis is put to practical daily tests.

(b) Sporadic Diseases. - Diseases of the respiratory system and of the digestive system which are not widely spread or epidemic.

5th Sem. Prerequisites Vet. Anat. 101, 133, 202, 234, 303, 404; Vet. Path. and Bact. 350, 435; Vet. Phys. 322, 424; recitations 5; lab 1, 3 hr; credit 5; fee $2.50.

550. **Clinics.** (See below.)

606. **Practice and Diagnosis.** A continuation of 505 Diseases of the liver, pancreas, peritoneum; diseases of the nervous system, of the organs of locomotion, and of the skin. Those diseases which are not widely spread or epidemic.

6th Sem. Prerequisites 505, 550; recitations 4; credit 4

651. **Clinics.** (See below.)

707. **Infectious Diseases and Sanitation.** Acute general infectious diseases; acute exanthematous infectious diseases; acute infectious diseases localizing in certain organs, and those affecting especially the nervous system; sanitary and quarantine measures employed here and in other countries.

7th Sem. Prerequisites 606, 651; Vet Phys 634; Vet Path 637; Vet Surg 626; recitations 4; credit 4.

752. **Clinics.** (See below)

808. **Infectious Diseases and Sanitation.** Chronic infectious diseases; diseases caused by protozoa; diseases of the blood and blood-forming organs; diseases of metabolism; diseases of the kidneys; diseases of the bladder; diseases of the heart; and ophthalmology. In this subject, as well as 707, students are given all possible opportunity to study actual outbreaks of the contagious diseases.

8th Sem. Prerequisites 707, 752, Vet Surg 727, recitation 5; credit 5

550, 651, 752, and 853. **Clinics.** From one to three P. M. each day of the week except Sunday, clinics are held in the Veterinary Hospital. These are held in conjunction with the surgical clinics, and the cases are assigned to Senior students in alphabetical order The student is then required to make an examination and report his findings to the clinician in charge. Clinical work is required throughout the Junior and Senior years.

**Ambulatory Clinic.** In those cases where it has been found impractical to remove animals from the farms to the hospital, an automobile is provided to convey the student to the farm. For this work the Senior class is divided into squads of two or three. Each squad is required to be on duty for a period of one week at a time. The difficulties met with in actual practice, dealing with clients, etc., are thus met in a practical way by the Senior students. This is proving a very valuable addition to the clinical work.

**Post Mortem Work.** Attendance at post mortem examinations is required of students taking clinical work. Post mortem examinations are a part of the clinic. This work is carried on with the coöperation of the Department of Pathology.

## VOCATIONAL EDUCATION

By the enactment of the Smith-Hughes law, Congress has provided funds for encouraging and assisting in the development of instruction throughout the country in agriculture, home economics, and trade and industry. The Smith-Hughes law gives great emphasis to the kind of instruction in these lines which will prepare the student to enter the corresponding vocations.

Attention is called to the announcement of the new four-year collegiate combined courses in:

Home Economics and Agriculture (see page 219).

Agriculture and Manual Training (see page 98).

For a student who would prepare for teaching Manual Training exclusively, attention is called to the opportunity to select studies that are now being given as parts of various courses. These studies may be so arranged as to make an excellent preparation for Manual Training teaching when supplemented by work in organization, presentation, and adaptation of Manual Training courses such as may be given in the Summer Session.

Training for the vocations and for the professions that are intimately associated with certain vocations is the chief work of Iowa State College, as is shown by the fact that the great majority of graduates from four-year courses, and certificate holders who have finished the two-year courses, go directly from college into vocations as professional men or as experts, artisans, and workmen.

Attention is invited to a new arrangement which permits students desiring to take non-collegiate work in Agriculture to enter the college in the fall and leave early in the spring, thus securing one semester of work during the winter months. Attention is further invited to a new part-time course for telephone men in which actual work and class room instruction are alternated (see page 340).

# ZOOLOGY

PROFESSOR GUTHRIE (Acting Chairman), Science Building, Room 314
Professor Summers (absent on leave); Associate Professor Ewing; Assistant Professors Harrison, Scullen, Millen, Baldwin; Instructors Hartzell, Werner; Assistant Ressler; Teaching Fellow Hoffman

*For information concerning the Division of Industrial Science, see page 76.*

The demand for individuals well trained in economic zoology has increased in recent years much faster than the supply. Students who are well trained in economic zoology will find several inviting and profitable lines of work open for them. In the employ of the government and on state boards, bureaus and commissions are hundreds of scientists, who, having completed their training in college along the lines of economic zoology, entomology, and apiculture, are now occupying well paying positions of trust and service, with an abundance of time at their disposal for investigation and study in the specially selected field. Not only does the special work in economic zoology fit students for positions as investigators in these various branches of government and state service, but the course is sufficiently broad to equip them for teaching and extension positions, or for that matter the scope of the course ensures a liberal education in itself, although this is not its primary object.

The work in the department as a whole is largely foundation work, which gives that knowledge of the biological laws and the data necessary for profitable specialization in the lines of animal husbandry, veterinary medicine and home economics, as well as other lines in industrial science and agriculture. For this work the zoological laboratories are well equipped with apparatus and materials.

The instruction in zoology proper is given on the third and fourth floors of the new Science Hall, while the work in entomology and apiculture is given in the front wing, second floor, of the Chemistry Building. The general museum is housed on the top floor of Morrill Hall; the insect collections are kept in proximity to the entomological laboratories. In the museum material has been selected with care so as to show variations and adaptations in all the major divisions of the animal kingdom. The natural arrangement has been followed, beginning at the left as you enter the main door. This museum is open during the week days, and visitors as well as students will find that much time can be profitably spent in it. The insect collection is quite large, containing over sixty thousand mounted specimens. In it are found many types, some of them being those of Van Duzee and of Osborn. Recently many additions have been made to the collections, including insects from the far west.

The one year non-collegiate work in commercial Apiculture is designed to give the students a chance to prepare themselves for beekeeping on a commercial scale. See page 358.

## Course in Industrial Science—Major Economic Zoology

### Groups in Applied Entomology and Apiculture

For Freshman year, see page 246.

During the year the students are advised to take Zoology 2, 5 hours, and Zoology 3, 5 hours

SOPHOMORE YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Zool. 304: General Entomology | 3⅓ | Zool. 317 Economic Entomology | 3 |
| * Zool 2 · Gen. Zool (5); Bot 127: Gen Bot (5); Chem. 103 · Gen Chem. (4) | 9–10 | * Zool 3 Gen Zool (5); Bot. 128: Gen. Bot (5); Chem. 104: Gen Chem and Qual. Anal. (4) | 9–10 |
| Farm Cr. 1 · Corn Production | 2⅔ | Mil. Sci. 4: Military Art | 1 |
| Mil. Sci. 3: Military Art | 1 | **Mod Lang German | 3 |
| **Mod. Lang.: German | 3 | Phys Tr 4 | R |
| Phys Tr 3 | R | Phys. 205: Mechanics, Heat and Light | 2⅔ |
| | 18–19 | | 18–19 |

* Student will take the two sciences not taken in the Freshman year

** Students who have completed Modern Language 17 or 21 or equivalent, may drop Modern Language and choose an equivalent number of hours elective

JUNIOR YEAR

| Fifth Semester | Credits | Sixth Semester | Credits |
|---|---|---|---|
| Zool. 402 Gen Apiculture | 4 | Zool 49 Bird Study | 1 |
| Bact 1 · Gen Bacteriology | 4 | Zool 6 Evolution | 2 |
| Bot. 308: Gen. Plant Pathology of Horticultural Plants | 2⅔ | Zool. 340 Orchard and Nursery Inspection | 2 |
| Chem. 351: Applied Organic Chemistry | 3⅓ | Zool. 403 Gen Apiculture | 4 |
| †Electives | 1⅓ | Farm Cr 22: Small Grains | 2⅔ |
| †Mil. Sci. 9 Military Art | 1 | Hort. 3 Gen Horticulture | 2⅔ |
| | | †Electives | 1⅓ |
| | | †Mil. Sci 10: Military Art | 1 |
| | 17[5] | | 17[5] |

[1] The number refers to the description of the study

[2] For definition of a credit, see page 81

[3] R indicates that the study is required, without credit, for graduation

[5] In the Junior and Senior years the credits may be increased to twenty for each semester with the consent of the Dean of Industrial Science

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

SENIOR YEAR

| Seventh Semester | Credits | Eighth Semester | Credits |
|---|---|---|---|
| Zool 65: Histology | 3 | Zool. 336 Forest Entomology | 2⅔ |
| Zool. 341: Literature of Ent. | 1 | Zool. 355· Research in Entomology | 2 to 9 |
| Zool. 354: Elementary Research in Entomology | 5 | Bot 18 Flower Ecology | 1⅔ |
| Zool. 357: Parasites and Disease-carrying Insects | 3⅓ | Bact. 56: Bee Diseases | 2 |
| Engl 412 or 413: Argumentation or Advanced Composition | 2 | Agr'l Engr. 22: Mechanics and Machinery | 1⅔ |
| †Electives | 2 | †Electives | 0 to 7⅔ |
| †Mil. Sci. 11: Military Art | 1 | †Mil Sci. 12: Military Art | 1 |
| | 17⅓[5] | | 17[5] or 18 |

## Description of Studies

| Groups | Undergraduate | Undergraduate and Graduate | Graduate |
|---|---|---|---|
| General Zoology | 2[1], 3, 15, 46, 49, 51, 52 | 6, 65 | 11, 64 |
| Physiology | 112, 150 | | 151 |
| Embryology | 231, 247 | | 248 |
| Entomology | 304, 308, 317, 336, 344, 345, 353, 357 | 340, 341, 354, 355, 359 | 356, 360 |
| Apiculture | 401, 402, 403, 404, 405 | | |

The following studies in this department have been omitted from the Catalogue for the period of the war· 7, 10, 14, and 16

### General Zoology

2. **General Zoology.** Together with 3, designed to give an outline knowledge of the entire animal kingdom, as well as of the more important biological laws. Structure of the ameba, hydra, jellyfish, earthworm, starfish, crayfish, and locust; comparison with related animals; physiology and life histories to serve as a foundation for a knowledge of the general laws of animal life

1st or 3rd Sem. Recitations 3, labs, 2, 3 hr., credit 5; fee $3 00.

3. **General Zoology.** Vertebrate morphology of several type forms such as the shark, necturus, and cat as compared with the organ systems in fishes, amphibians, reptiles, birds, and mammals The fundamentals of physiology, histology, and vertebrate embryology, together with the history of Zoology.

2nd or 4th Sem. Prerequisite 2; recitations 3; labs. 2, 3 hr.; credit 5; fee $3.00.

[1] The number refers to the description of the study.

† May be omitted by students appointed to the Reserve Officers' Training Corps. For full information, see page 270.

6. **Evolution of Animals.** Problems and factors of organic evolution, heredity, variation, origin and distribution of life.

8th Sem. Prerequisite 3, 15, 46, 51, or 52; recitation 1; lab. 1, 3 hr.; credit 2; fee $3.00.

15. **General Zoology.** The anatomy of the crayfish; the general structure of crustacea; the anatomy of the shark; the general morphology of vertebrates. General animal physiology, and an outline of the comparative anatomy of some of the chief organs of the vertebrates, and of elementary vertebrate embryology.

3rd Sem. Recitations 2; lab. 1, 3 hr.; credit 3; fee $3.00.

46. **General Zoology.** An introduction both to general animal morphology and physiology, and to the more special work in entomology. The grasshopper; the crayfish; the shark head and the frog. General principles of zoology, including physiology and development.

3rd Sem. Recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.

49. **Bird Study.** The identification, habits, and economic importance of our Iowa birds. Birds of the vicinity will be studied on early morning trips under guidance of an instructor.

5th or 8th Sem. Prerequisites Zool. 3, 46, 51, or 52; recitation 1; credit 1; fee $.75.

51. **General Zoology.** For Home Economics students. An introduction to general animal morphology and physiology. The crayfish, general biological principles; the dog-shark, the necturus; vertebrate morphology and physiology.

3rd or 4th Sem. Recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.

52. **General Zoology.** Designed to give an outline knowledge of the animal kingdom, as well as of the more important biological laws. Laboratory study of crayfish, grasshopper, dogfish, and necturus; the broad physiological principles, relationships of the animal phyla as shown by anatomy, fossil forms and development; economic species and principles underlying development especially emphasized.

4th Sem. Recitations 3; labs. 3, 2 hr.; credit 5; fee $3.00.

64. **Research in Zoology.** Investigation in some zoological subject suitable for a thesis. The prerequisites and the selection of the work and the amount of time required will be in each case determined by consultation with the head of the department. PROFESSOR GUTHRIE.

Both Sems. Fee $3.00.

65. **Histology and Histological Technique.** A course in normal histology, together with the preparation, sectioning, and staining of tissues for microscopical study.

5th Sem. Prerequisites 3, 15, 46, 51, or 52; recitations 1; labs. 2, 3 hr.; credit 3; fee $3.00.

### PHYSIOLOGY

112. **Physiology for Home Economics Students.** The structure, development, and functions of the human body. The following divisions of the subject are covered: General Histology, Digestive System, Respira-

tory System, Circulatory System, Excretory System. To be followed by Zool. 150.

5th Sem. Prerequisites 3 or 51, and Chem. 375 and Chem. 403 (Chem. 403 not required of Science and Domestic Art students); (Chem. 403 may be taken with Zool. 112); recitations 3; labs. 2, 2 hr.; credit 4⅓; fee $3.00.

150. **Physiology for Home Economics Students.** Continuation of Zoology 112. The following divisions of the subject are covered: Physiology of Contraction and Conduction, Nervous System, Special Senses, Ductless Glands, Body Temperature, Reproduction and Growth.

6th Sem. Recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.

151. **Research in Physiology.** Investigations in some physiological subject suitable for a thesis. The prerequisites and the selection of work and the amount of time required will be determined in each case by consultation with person in charge of work.

ASSISTANT PROFESSORS SCULLEN AND BALDWIN

Both Sems. Fee $3.00.

### EMBRYOLOGY

231. **Embryology.** Vertebrate development studied mainly from chick embryos, both alive and in preparations made largely by the student; embryonic and fetal membranes; the general principles of development beginning with germ cell structure, maturation, fertilization, and tracing the modifications of cleavage and gastrulation as found in the different classes of vertebrates; histological differentiation and organogeny.

5th Sem. Prerequisites 3, 15, 51, or 52; recitations 2; labs. 1, 2 hr.; credit 2⅔; fee $3.00.

247. **Embryology for Veterinary Students.** Similar to 231, but mammalian development especially emphasized. Dissection of pig uterus and embryos.

4th Sem. Prerequisite 3, 15, or 52; recitations 2; lab. 1, 3 hr.; credit 3; fee $3.00.

248. **Research in Embryology.** Investigation of some problem in development suitable for presentation as a thesis. The prerequisites and the selection of work and the amount of time required will be determined in each case by consultation with the head of the department.

PROFESSOR GUTHRIE

Both Sems. Fee $3.00.

### ENTOMOLOGY

304. **General Entomology.** The structure, habits, life history, and classification of insects, designed as an introduction to the subject for those intending to make a specialty of entomology, and as a foundation for the practical work in economic entomology. A detailed study of certain representative forms, beginning with the grasshopper; the field study, collection and classification of as many species as possible representing different orders of insects; the detailed life history of representatives of the different orders.

5th and 6th Sems. Prerequisite 3, 15, 52, or 46 (no prerequisite for Hort. students); recitations 2; labs. 2, 2 hr.; credit 3⅓; deposit $3.00.

308. **Animal Parasites.** The more injurious parasites of domestic animals.

7th Sem. Prerequisite 2, 15, 46, 51, or 52; recitations 2; credit 2.

317. **Economic Entomology.** Field, insectary, and laboratory studies of the chief economic species of insects found in Iowa, accompanied by the literature relating to the other more important American species.

4th, 6th, or 8th Sem. Prerequisite 304, recitations 2, lab. 1, 3 hr; credit 3, deposit $3.00.

336. **Forest Entomology.** Life histories and habits of the more important insects injurious to American forests and forest products. So far as possible the insects and their work will be studied in the field as well as in the laboratory.

6th or 8th Sem. Prerequisite 304, recitations 2, lab 1, 2 hr.; credit 2⅔; deposit $3.00.

340. **Orchard and Nursery Inspection.** The methods of inspection of nurseries and orchards for insect pests; legislation and quarantine methods.

6th Sem. Prerequisite 304, recitation 1, lab 1, 3 hr; credit 2, deposit $3 00

341. **Literature of Entomology.** Sources of information; preparation of catalogues of insects; the methods of determining the priority of scientific names.

7th Sem. Prerequisite 304, recitation 1, credit 1.

344 **Horticultural Entomology.** Designed to give a detailed study of entomology in the field, the insectary, and the laboratory Chief insects attacking horticultural crops

6th Sem Prerequisite, Zoology 304, recitations 2; labs 2, 2 hr, credit 3⅓, deposit $3.00

345. **Agronomic Entomology.** The chief economic species of insects with special reference to those attacking field crops

6th Sem Recitations 2, labs 2, 2 hr, credit 3⅓, deposit $3 00

353. **Insects Injurious to Foods and Fabrics.** The chief pests of meal, flour, etc., and those injuring fabrics, together with methods for their control.

5th or 7th Sem. Prerequisites 3, 46, 51, or 52, recitation 1, credit 1

354. **Elementary Research in Entomology.** Entomology or animal parasites. Preparation of theses not required. ASSOCIATE PROFESSOR EWING

7th Sem. Prerequisites 3, 15, or 46, labs. time arranged, 10 hrs required; credit 5; deposit $3.00.

355. **Advanced Research in Entomology.** Preparation of thesis in entomology or parasitology. ASSOCIATE PROFESSOR EWING

8th Sem Prerequisite 304; labs time arranged; credits 2 to 9, deposit $3 00.

356. **Advanced Research in Entomology.** Preparation of master's thesis in entomology or parasitology ASSOCIATE PROFESSOR EWING

Both Sems. Prerequisite 355; labs. time arranged; credit according to lab. schedule; deposit $5.00.

357. **Parasites and Disease Carrying Insects.** A general subject treating of the pathogenic protozoa, flat worms, round worms, leeches,

external parasites, and disease carrying mites, insects, and other arthropods.

5th or 7th Sem. Prerequisite 2, 15, 46, 51, or 52; recitations 2; labs. 2, 2 hr.; credit 3⅓; deposit $3.00.

359. **Greenhouse and Truck Crop Pests.** The more important insect pests of greenhouse plants and truck crops, with methods for their control. Designed for students majoring in floriculture and market gardening.

7th Sem. Prerequisite 344; recitation 1; lect. and lab. combined 1, 2 hr.; credit 2,; deposit $3.00.

360. **Systematic Entomology.** The general principles of taxonomic practice including a comparative study of different codes on nomenclature used by Entomologists with special reference to the international code of Zoological nomenclature. Each student will be assigned some special group of insects to work upon. The department collections are available for reference. Opportunity will be given for working up a private collection in the group chosen.

Either Sem. Prerequisites 3, 15, 52, or 46 and 304. Time and credit as arranged. Fee $3 00.

APICULTURE

401. **Farm Apiculture.** Elementary Designed to give the necessary information for the care and management of the honey bee in the small apiary.

2nd, 4th, 6th, or 8th Sem Recitation 1, lab 1, 3 hr., credit 2; deposit $3 00.

402. **General Apiculture.** The life history and habits of the honey bee; the anatomy, physiology and development of the honey bee; literature on bees and beekeeping.

1st Sem. Recitations 2; labs 2, 3 hr; credit 4; fee $3.00.

403. **General Apiculture.** Continuation of 402. Modern methods of practice in apiculture; sources of nectar and pollen; manipulation of the colony.

2nd Sem. Recitations 2; labs 2, 3 hr.; credit 4; fee $3 00.

404. **Commercial Apiculture.** History of Beekeeping; location of apiary; rendering beeswax; manufacture and use of comb foundation; assembling supplies, use of apparatus; fall management and methods of wintering; preparation and marketing of the honey crop.

1st Sem Recitations 2; lab. 1, 3 hr.; credit 3; fee $3 00.

405. **Commercial Apiculture,** continued. Systems of management for the production of comb and extracted honey; commercial queen rearing; transferring bees; swarm control; symptoms and treatment of bee diseases.

2nd Sem. Recitations 2; lab. 1, 3 hr; credit 3; fee $3.00.

# Non-Collegiate Work

Two-year course in agriculture; two-year course in home economics; vocational courses in engineering—for electrical workers and stationary engineers, mechanical draftsmen and mechanicians, structural draftsmen and building superintendents, telephone plant-men; one-year course in dairying, one-year course for herdsmen, one-year course in bee-keeping, and six-weeks course for garden club leaders.

## *OFFICERS OF INSTRUCTION

Raymond Allen Pearson. 1912.....President
B. S. in Agr., Cornell University, 1894; M. S. in Agr., 1899; LL. D., Alfred University, 1909; D. of Agr., University of Nebraska, 1917.

Charles Franklin Curtiss. 1897, 1891..Dean of the Division of Agriculture
B. S. A., Iowa State College, 1887; M. S. A., 1892; D. Sc. in Agriculture, Michigan Agricultural College, 1907.

**Anson Marston. 1892..Dean of the Division of Engineering, Professor of Civil Engineering
C. E., Cornell University, 1889.

Samuel Walker Beyer. 1898, 1891...Dean of the Division of Engineering, Professor of Geology and Mining Engineering
B. S., Iowa State College, 1889: Ph. D., Johns Hopkins Univ., 1895.

Charles Henry Stange. 1909, 1907....Dean of the Division of Veterinary Medicine, Professor of Theory and Practice and Diagnosis
D. V. M., Iowa State College, 1907.

Robert Earle Buchanan. 1909, 1904....Dean of the Division of Industrial Science, Professor of Bacteriology
B. S., Iowa State College, 1904; M. S., 1906; Ph. D., University of Chicago, 1908.

Catharine J. MacKay. 1913, 1910.....Dean of the Division of Home Economics
Drexel Institute, Diploma in Domestic Science, 1907; Boston Cooking School, 1909; Teachers' College, Columbia University.

### PROFESSORS

Jules Cool Cunningham. 1913, 1911.....Professor of Horticulture and Botany
B. S., Kansas State College, 1905.

Henry Louis Eichling. 1916, 1911.....Professor of Farm Crops, Soils, and Farm Management
B. S. in Agr., Iowa State College, 1911.

* The Non-Collegiate Faculty consists of the President; the Deans of Agriculture, Engineering, Home Economics, Industrial Science, and Veterinary Medicine; and the Professors and Associate Professors doing non-collegiate work.

** On leave of absence for Military Service.

Kenneth G. Smith. 1913.....Professor of Engineering Extension
A. B., University of Chicago, 1896; B. S. in M. E., University of Illinois, 1905; M. E., 1916.

Mark G. Thornburg. 1914, 1910.....Professor of Animal Husbandry
B. S. A., Iowa State College, 1910.

ASSOCIATE PROFESSORS

Esther L. Cooper. 1916, 1909.....Associate Professor of English
Ph. B., State University of Iowa, 1903.

Myrtle Ferguson. 1916, 1915....Associate Professor of Home Economics
B. S., Iowa State College, 1910; B. S. in H. E., 1911.

Claude Kedzie Shedd. 1913, 1911.....Associate Professor of Agr. Engr.
B. S. in Agr., University of Nebraska, 1909; B. S. in Agr. Engr., Iowa State College, 1914.

ASSISTANT PROFESSORS

Alfred B. Caine. 1917, 1916.....Animal Husbandry
B. S., Utah Agricultural College, 1914; M. S. in A. H., Iowa State College, 1917.

*Willard F. Guard. 1916, 1914.....Veterinary
D. V. M., Ohio State University, 1912.

Frederick L. Overley. 1913, 1912.....Horticulture
B. S. in Hort., Iowa State College, 1912; M. S. in Hort., 1916.

Everett Henry Rucker. 1917.....Poultry Husbandry
B. S. A., University of Missouri, 1915; A. M., 1916.

Charles Everett Watts. 1917.....Botany and Bacteriology
B. S. in Ag., Iowa State College, 1913.

D. Harold Zentmire. 1916, 1912.....Farm Crops, Soils and Farm
B. S. in Agron., Iowa State College, 1913. Management

INSTRUCTORS

Ernest Chas. Ainsworth, B. S.....Dairying, 1917
A. B. Campbell, B. S. in E. E.....Electrical Engineering, 1915
Harry William Anderson.....C. E. and Arch. E., 1917
Lenore Dunnigan, B. S.....Chemistry, 1917
Mabel Alice Fleming, B. S.....English, 1912
Annie Hawkes.....Home Economics, 1914
Gertrude A. Herr, B. S., M. S.....Mathematics, 1913
Palma Iverson, B. A.....Mathematics, 1916
William Francis La Grange, B. S.....Animal Husbandry, 1917
W. H. Lancelot.....Chemistry, 1914
*W. R. Little, B. S. in M. E.....Mechanical Engineering, 1915
Conrad William Schwark.....Dairying, 1917
Charles Miller, B. Sc.....Agricultural Engineering, 1913

* On leave of absence for Military Service.

Jean Peterson..... .....Physical Culture, 1917
Esther Rebok, B. S ..... .. .... . ... .....Home Economics, 1917
Mabel Russell.... . . ..... ..... .....Home Economics, 1916
Mildred Semmons, B S. ..... .....Public Speaking, 1917
Roy Olin Westley, B. S Farm Crops, Soils and Farm Management, 1917
Mrs. Edwin S. Youtz, B. Ph .. .... . . . ..... .....English, 1914

ASSISTANTS

Amy Nell Purvis, B. A..... ..... .....Botany, 1917

## CALENDAR

(For Calendar, see page 6).

## REQUIREMENTS FOR ADMISSION

Any student desiring to enter a non-collegiate course must be at least seventeen years of age and must present a certificate signed by his county or high school superintendent showing that he has satisfactorily completed the eighth grade of the public schools or its equivalent. If the applicant has attended high school, this certificate must also give his complete high school or academic record. All applications for admission should be addressed to the *Registrar, Iowa State College*, who will furnish the proper blanks. These certificates should be filed with the Registrar as promptly as possible, and at least two weeks before the opening of the semester.

These courses are not intended to be preparatory for the four-year courses, though through them some entrance credit may be secured. This is, however, not their chief function; and students who are merely seeking entrance credits are advised to obtain them in the high school.

High school graduates who are able to meet the entrance requirements of the collegiate courses, or students who are able to present 14 units of acceptable high school or academic work, are not eligible to the non-collegiate courses, with the exception of the one-year dairy and the one-year herdsmen's courses. Such students are referred to the two-year collegiate course in agriculture as set forth on page 96. Opportunities are there offered for work of advanced grade covering practically the same subjects as are taught in the non-collegiate courses This work is better adapted to high school graduates than is that of the two-year non-collegiate courses.

## FEES AND EXPENSES

The entire expenses of a student need not exceed $400.00 per year at the college.

**Tuition.** No charge for tuition is made to the students from the State of Iowa. To the non-residents, a tuition fee of $50.00 a year is charged.

Two tuition scholarships are available for non-collegiate students. See page 39 for complete discussion of tuition scholarships.

**Incidental and Janitor Fees.** The regular incidental and janitor fee

for the semester is $10.00 for all students who complete their classification during the regular classification period, Saturday and Monday. Beginning with the first day on which classes are held the fee for sub-collegiate students will be $12.00 when classifying after the regular classification period. This fee is used as follows: Hospital, $2.50; students' repair fund, $1.00; incidental and janitor service, balance.

**Laboratory Fees.** Laboratory fees at the actual cost of breakage and usage are charged to the students, the Treasurer's receipt for such fees being required before the students are admitted to laboratories. Some fees represent charges for mimeograph notes which are furnished at cost; usually when these notes are supplied no text-book is required and the fee is in lieu of text-book purchase. Deposits are required in some departments to cover the value of equipment loaned to students, and at the end of the semester the amount is returned, less deduction for loss and breakage. For the amount of the fee in any study the student should refer to the description of studies, under the department in which the study is taught.

**Certificate Fee.** A fee of two dollars ($2.00) is charged for the final certificate issued upon completion of all non-collegiate courses.

**Correspondence Fee.** For correspondence work in some subjects a fee is required. For amount, see description of studies. Twenty-five per cent rebate is allowed when any correspondence study is completed and the examination is successfully passed.

**Board and Rooms.** Students can secure furnished rooms and board in clubs or private families adjacent to the College grounds at $5.75 per week.

All young women students are required to secure rooms through the Advisor for Women; the young men students, in order to avoid undesirable rooms and houses, should consult the Secretary of the Young Men's Christian Association, Alumni Hall, Ames, Iowa.

The college authorities reserve the right to forbid students to room in any house which for sanitary or other reasons is undesirable.

**Text Books.** All text books and stationery may be purchased at the College Book Store at about 20 per cent below the average retail price.

## DEPARTMENTS OF INSTRUCTION

**Definition of a Credit.** The amount of work in each study is expressed in credits, a credit meaning one recitation or its equivalent a week throughout the semester. Since it is considered that one hour of recitation or lecture, including the necessary preparation, is equivalent to a three-hour laboratory, it receives the same credit. Any two-hour laboratory is equivalent to two-thirds of a three-hour laboratory.

### Optional Studies in the Non-Collegiate Courses

With the consent of the Dean of Agriculture for agricultural students, of the Dean of Engineering for engineering students, and of the Dean of Home Economics for home economics students, students having the prerequisite preparation may elect subjects from the following list, in place of any study named in the regular semester schedules, provided they have the equivalent of two and a half years of high school work, or have received credit in advance for part of the required work scheduled. Two-year students may take an additional course in English in the second year with the approval of their dean.

FALL SEMESTER

| | Credits | | Credits |
|---|---|---|---|
| Bot. T3: General Botany | 1⅔ | M. E. E1: Shop Drawing | 2 |
| Bot. T5: Plant Diseases | 1⅔ | M. E. E22: Automobile Operation | 1 |
| Bot. T6: General Botany | 1⅔ | M. E. E23: Automobile Practice | 1 |
| Hort. A10: Small Fruits and Vegetables | 1⅔ | Phys. T1: Elementary Physics | 3 |
| Math. T7: Algebra | 5 | Str. Des. E1: Drawing | 2 |
| Math. T11: Shop Mathematics | 4 | Zool. T402: General Apiculture | 4 |
| Math. T20: Algebra to Involution | 3 | Zool. T404: Commercial Apiculture | 3 |

SPRING SEMESTER

| | Credits | | Credits |
|---|---|---|---|
| C. E. E4: Cement Products | 2 | Math. T17: Plane Trigonometry | 5 |
| Hort. A12: Practical Landscape Gardening | 1⅔ | Math. T21: Algebra | 3 |
| Hort. A13: Greenhouse Crops | 1⅔ | M. E. E2: Shop Drawing | 2 |
| Math. T8: Algebra | 5 | Str. Des. E2: Drawing | 2 |
| | | Zool. T403: General Apiculture | 4 |
| | | Zool. T405: Commercial Apiculture | 3 |

EITHER SEMESTER

| | Credits | | Credits |
|---|---|---|---|
| Engl. T1: The Sentence | 4 | Engl. T13: Practice of English | 3 |
| Engl. T2: Rhetoric and Composition | 4 | Math. T3: Algebra Review | 4-5 |
| Engl. T16: Elementary Grammar | 3 | Math. T5: Plane Geometry | 5 |
| Engl. T17: Rhetoric and Composition | 3 | Math. T16: Solid Geometry | 3 |
| Engl. T21: The Informational Article | 2 | M. E. E5a: Wood Shop Work | 1 |
| Hist. T2: Advanced American History | 4 | M. E. E5b: Wood Shop Work | 2 |
| Engl. T11: English Classics | 3 | M. E. E6a: Pattern Work | 2 |
| Engl. T12: English Classics | 4 | M. E. E6b: Pattern Work | 1 |
| | | M. E. E7: Forge Work | 2 |
| | | M. E. E9: Foundry Work | 1 |
| | | Pub. Sp. T2: Public Speaking | 1 |
| | | Pub. Sp. T3: Public Speaking | 1 |

## AGRICULTURAL ENGINEERING

ASSOCIATE PROFESSOR SHEDD, Agricultural Engineering Hall, Room 203
Instructors Miller, .....?.

### Description of Studies

A1. **Blacksmithing.** Forging and welding iron and steel. Making and tempering small tools. Repair of machinery.

1st or 2nd Sem. Lab. 1, 3 hr.; credit 1; fee $2.50.

A2. **Carpentry.** Use and care of tools. Joining, framing, rafter cutting, and construction of farm buildings.

1st or 2nd Sem. Lab. 1, 3 hr ; credit 1; fee $2.50.

A4. **Agricultural Surveying.** Mensuration of land, surveying, land drainage, prevention of hillside erosion, road construction. Drawing, lettering, and map making.

2nd Sem. Recitation 1; lab. lecture 1, 2 hr.; credit 2; fee $1.00.

A5. **Farm Machinery and Farm Motors.** Study of the construction, adjustment, operation, and testing of farm implements, steam engines, gas engines, windmills, etc.

3rd Sem. Prerequisite A1; recitations 2; lab. 1, 2 hr.; credit 2½; fee $2.00.

A6. **Farm Buildings.** Study of planning, estimating, building materials, lighting, heating, ventilation, water supply, and sewage disposal.

Laboratory work: drawing plans, practice in concrete and masonry construction, and pipe fitting.

**4th Sem.** Recitation 1; lab. lecture 1, 2 hr.; credit 2; fee $1.00.

E7. **Drainage and Irrigation.** Study of theory and practice of drainage and irrigation. Drainage laws of Iowa. Field practice in surveying for drainage and irrigation works.

**3rd Sem.** Recitations 2; lab. 1, 3 hr.; credit 3; fee $1.00.

A8. **Gas Engines and Feed Grinders.** Study of construction, adjustment and operation of gas engines, feed mills, feed cutters, etc. For Herdsmen.

**1st Term.** Recitation 1; lab 1, 3 hr for 12 weeks; credit 1½; fee $2 00.

A9. **Farm Motors and Horticultural Machinery.** Study of the construction and utility, and practice in operation, adjustment, and testing of gas and steam engines, tractors, motor trucks, and garden, potato, and spraying machinery. Students in the course will be permitted to select from the subjects mentioned above.

**4th Sem.** Prerequisite A5; lab. lecture 1, 2 hr , credit 1; fee $2 00.

A23. **Dairy Engineering.** Study of construction, management, repair, operation, adjustment, and testing of steam boilers and engines, gas engines, refrigerating machinery, and power transmission machinery; also pipe fitting and soldering.

**1st Sem.** Recitations 2; lab. 1, 3 hr ; credit 3; fee $2 50.

## AGRICULTURAL JOURNALISM

### Description of Studies

A7. **Livestock Advertising.** A study of advertising as it relates to livestock selling. Fundamental principles are considered and then put to practical use in planning advertising campaigns and writing advertising for a hypothetical livestock business that each student sets up for himself.

**2nd Term.** Recitation 1; credit ¾.

## AGRICULTURE

Dean Curtiss, Agricultural Hall, Room 124

(For Two-Year Collegiate courses in Agriculture, see page 96.)

The two-year course in agriculture is offered in order to meet the demand of young men who have not had the advantages of high school training, and who wish to obtain such preparation for practical agricultural work as a two-year course will afford. It has special application to practical problems in agriculture in its various phases.

## Two-Year Course in Agriculture

(For entrance requirements, see page 322)

Upon the completion of this course, the student will be granted a certificate.

FIRST YEAR

| First Semester | Credits[2] |
|---|---|
| Agr'l Engr. A1[1]: Blacksmithing or A2: Carpentry | 1 |
| Farm Cr. A1: Corn Production | 2⅔ |
| A. H. A1a: Types and Market Classes | 2 |
| A. H A5: Feeding and Management | 2⅔ |
| Bot. T1a: Agricultural Botany | 1⅔ |
| Bot. T2a: Farm Weeds and Seeds | ⅔ |
| Chem. T57: Agricultural Chemistry | 2 |
| Dairy A12: Principles of Dairying | 2⅔ |
| Engl. T13: The Practice of English | 3 |
| Phys. Tr. T1 | R |
| Mil. Sci T1: Military Art | 1 |
| | 19⅓ |

| Second Semester | Credits[2] |
|---|---|
| Agr'l Engr. A1: Blacksmithing | 1 |
| Agr'l Engr. A4: Agricultural Surveying | 2 |
| Farm Cr. A2: Small Grain Production | 2⅔ |
| A. H. A2a · Types and Market Classes | 2 |
| A H. A6: Feeding and Management | 2⅔ |
| Engl. T15: Elementary Composition | 3 |
| Farm Man. A2: Farm Accounts | 1⅔ |
| Hort A1: Plant Propagation | 1 |
| Hort. A3: Fruit and Vegetable Growing | 1⅔ |
| Phys Tr. T2 | R |
| Mil. Sci. T2: Military Art | 1 |
| | 18⅔ |

Students capable of carrying additional work may elect:

| | |
|---|---|
| Horticulture A6: Orchard Practice | 1⅔ |
| Agriculture A1: Practical Agriculture, 3 months' work | R |

| Third Semester | Credits |
|---|---|
| Agr'l Engr. A5: Farm Machinery and Farm Motors | 2⅔ |
| A. H. A3: Breed Studies of Beef Cattle and Sheep | 3⅓ |
| Soils A51: Soil Physics | 3 |
| Farm Man. A1: Farm Management | 3 |

| Fourth Semester | Credits |
|---|---|
| Agr'l Engr. A6: Farm Buildings | 2 |
| Farm Cr. A3: Grasses and Forage Crops | 2 |
| Soils A52: Soil Fertility | 3 |
| A. H. A4: Breed Studies of Horses, Dairy Cattle, and Swine | 3⅓ |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.

| | | | |
|---|---|---|---|
| Hort. A3: Fruit and Vegetable Growing | 1⅔ | Econ. Sci. T22: Rural Economics | 2 |
| Phy. Tr. T3 | R | Hort. A14: Tree and Ornamentals | 1⅔ |
| Mil. Sci. T3: Military Art | 1 | Phys. Tr. T4 | R |
| | | Mil. Sci. T4: Military Art | 1 |
| | 14⅔* | | 15** |

*Four hours additional work will be required from the following group of electives:

| | |
|---|---|
| A. H. A7: Animal Breeding and Herd Book Study | 2 |
| A. H. A57: Special Study of the Breeds of Dairy Cattle | 2 |
| A. H. A36: Farm Meats | 1 |
| Bot. T5: Plant Diseases | 1⅔ |
| Dairy A2: Buttermaking | 2 |
| Dairy A3: Milk Testing | 2 |
| Dairy A6: Dairy Bacteriology | 1 |
| Engl. T11: English Classics | 3 |
| Engl. T21: The Informational Article | 2 |
| Engl. T17: Rhetoric and Composition | 3 |
| Hort. A13: Greenhouse Crops | 1⅔ |
| Vet. T2: Horse Shoeing and Obstetrics | 2 |

**Four hours additional work will be required from the following group of electives:

| | |
|---|---|
| Agr'l Engr. A9: Farm Motors and Horticultural Machinery | 1 |
| Farm Cr. A7: Grain Judging and Breeding | 1⅔ |
| A. H. A10: Market Classes and Grades of Live Stock | 1 |
| A. H. A12a: Poultry Management | 1⅔ |
| A. H. A11: Animal Feeding | 2 |
| A. H. A59: Milk Production and Herd Management | 2 |
| Dairy A8: Cheese Making | 1 |
| Dairy A14: Commercial Dairying | 1 |
| Dairy A21: Ice Cream and Ices | 1⅔ |
| Dairy A26: Judging Dairy Products | 1 |
| Dairy A30: Market Milk | 1 |
| Engl. T21: The Informational Article | 2 |
| Engl. T11: English Classics | 3 |
| Hort. A6: Orchard Practice | 1 |

### Description of Studies

A1. For the Two-Year Course in Agriculture, three months' practical work in agriculture will be required of all students to whom a certificate is granted. This work should be taken during the summer vacation, between the first and second years.

A2. For the One-Year Herdsmen Course, six months' practical work on some livestock breeding farm between the first and second term of the course.

A3. For the One-Year Herdsmen Course, one year practical work as herdsman or assistant herdsman with a reliable livestock breeding establishment.

A5. For the Six-Weeks' Course for Garden Club Leaders, six months' practical work following the completion of the prescribed six weeks' course is required before a certificate is granted.

## ANIMAL HUSBANDRY

PROFESSOR THORNBURG, Agricultural Hall, Room 105
Assistant Professors Caine, Rucker; Instructor La Grange

The Herdsmen Course is a specialized one-year course for young men who expect to have active charge of caring for pure-bred herds and flocks. The shortage of competent herdsmen is hindering the production of pure-bred livestock; more herds would be established if reliable help could be secured.

Instruction will be offered in two periods, the first from January 2nd to March 28th, 1918, the second from January to March, 1919. During the time between the two periods the student will be expected to be in the employment of some reliable breeder and must secure a satisfactory recommendation from his employer before continuing the second term's work. This, of course, is intended not for young men who expect to operate farms, but for men who want to take positions as herdsmen with stock breeding establishments.

### One-Year Herdsmen Course

(For requirements for admission, see page 322)

Upon completion of the course and one year of successful work as Herdsman, a certificate will be granted.

| First Term | Credits |
|---|---|
| A. H. A26: Market and Breed Types of Live Stock | 2½ |
| A. H. A28: General Live Stock Management | 2½ |
| A. H. A22: Feed Stuffs and Principles of Animal Feeding | 1½ |
| A. E. A8: Gas Engines | 1½ |
| Vet. T3: Farm Sanitation and Communicable Diseases | 1½ |
| F. C. A9: Corn and Small Grain Production | 2 |
| Engl. T13b: The Practice of English | 2½ |

| Second Term | Credits |
|---|---|
| A. H. A27: Market and Breed Types of Livestock | 2½ |
| A. H. A29: Specialized Livestock Management | 2½ |
| A. H. A20: Livestock Production | 1½ |
| A. H. A21: Animal Breeding | ¾ |
| A. H. A30: Pedigrees | 2 |
| Bot. T7: Poisonous Weeds | ¾ |
| Vet. T4: Obstetrics | 1½ |
| F. C. A10: Forage and Pasture Crops | 1½ |
| Agr'l Jour. A7: Livestock Advertising | ¾ |

| | | | |
|---|---|---|---|
| Agr'l A2: Practical work on some livestock breeding farm between terms | R | Agr'l A3: One year as herdsman or assistant herdsman with a reliable livestock breeding establishment | R |
| | 13¾ | | 13¾ |

## Description of Studies

A1. **Types and Market Classes of Beef Cattle and Sheep.** The study and judging of the types and market classes of beef cattle, mutton, and wool sheep.

1st Sem. Lecture 1; lab. 1, 3 hr; credit 2; fee $1.50.

A2. **Types and Market Classes of Dairy Cattle, Horses, and Swine.** The study and judging of the types and market classes of dairy cattle, horses and swine.

2nd Sem. Lecture 1; lab 1, 3 hr, credit 2; fee $1.50

A3. **Breed Studies of Beef Cattle and Sheep.** The study and judging of the breeds of beef cattle and sheep, their origin, history, characteristics, and adaptability to different conditions.

3rd Sem. Prerequisite A1; lectures 2; lab 2, 2 hr; credit 3⅓; fee $2.00.

A4. **Breed Studies of Dairy Cattle, Horses, and Swine.** The study and judging of the breeds of horses, dairy cattle and swine, their origin, history, characteristics, and adaptability to different conditions.

4th Sem. Prerequisite A2, lecture 2, lab 2, 2 hr.; credit 3⅓; fee $2 00.

A5. **Feeding and Management of Live Stock.** Feed stuffs, the principles of animal feeding and the practical feeding, care, and management of breeding and growing beef cattle.

1st Sem. Lectures 2, lab 1, 2 hr; credit 2⅔; fee $2 00.

A6 **Feeding and Management of Live Stock.** The practical feeding, care, and management of breeding and growing dairy cattle, horses, swine, and sheep.

2nd Sem. Lectures 2; lab 1, 2 hr, credit 2⅔, fee $2 00

A7. **Animal Breeding and Herd Book Study.** Principles of breeding, selection, improvement, the study of herd books and pedigrees.

3rd Sem. Lectures 2, credit 2.

A10. **Market Classes and Grades of Live Stock.** The classification, grading, and valuing of horses, cattle, sheep, and swine from the standpoint of the open market.

4th Sem. Prerequisites A1 and A2, lecture 1, credit 1.

A11. **Animal Feeding.** Composition and digestibility of food stuffs; the preparation of feeds; feeding standards and calculation of rations; feeding for beef, milk, pork, mutton, and wool; feeding horses for market and work.

4th Sem. Lectures 2; credit 2.

A12a, b. **Poultry Management.** (a) Poultry houses, yards, feeding, judging market types, incubation, brooding, anatomy of fowl, disease, san-

itation, caponizing, killing, dressing, and marketing. (b) Management of poultry from the standpoint of the farm flock.

4th and 2nd Sem. Lecture 1; lab. 1, 2 hr ; credit 1⅔; fee (a) $2.00, (b) $1.00.

A18. **Breeding and Judging Dairy Cattle.** Score card and comparative judging. Principles, methods, and practices of breeding and improvement.

1st Sem. Lecture 1; lab. 1, 3 hr.; credit 2.

A19. **Feeding and Management of Dairy Cattle.** Composition and use of various feeding materials. Influence of feeding stuffs on quantity, quality, and composition of milk and butter. Practical problems in the care and housing of dairy cattle.

2nd Sem. Lectures 2; credit 2.

A20. **Animal Production.** Feeding for market of cattle, swine and sheep. Feeding dairy cattle for milk production and horses for work. For Herdsmen.

2nd Term. Recitation 2; credit 1½.

A21 **Animal Breeding.** Principles of livestock breeding, selection and improvement. For Herdsmen.

2nd Term. Recitation 1; credit ¾.

A22. **Feed Stuffs and Principles of Animal Feeding.** Study of Feed Stuffs. The compounding and balancing of rations. For Herdsmen.

1st Term Recitation 2; credit 1½.

A26. **Market and Breed Types of Beef Cattle and Sheep.** Judging market types and representatives of different breeds of beef cattle and sheep. For Herdsmen.

1st Term. Recitation 2; lab. 2, 2 hr ; credit 2½ ; fee $2 00.

A27. **Market and Breed Types of Horses, Dairy Cattle and Swine.** Judging market types and representatives of different breeds of horses, dairy cattle and swine. For Herdsmen.

2nd Term. Recitation 2; lab. 2, 2 hr.; credit 2½ ; fee $2.00.

A28. **General Livestock Management.** Practical care and management of livestock. For Herdsmen.

1st Term. Recitation 2; lab. 2, 2 hr.; credit 2½ ; fee $2.00.

A29. **Specialized Livestock Management.** Continuation of A. H. A27. Students will be allowed to specialize in the care and management of livestock. For Herdsmen.

2nd Term. Recitation 2; lab. 2, 2 hr ; credit 2½ ; fee $2.00.

A30. **Pedigrees.** The study of pedigrees, blood lines, families and tribes, in the various breeds of livestock. For Herdsmen.

2nd Term Recitation 2; lab. 1, 2 hr.; credit 2

A36. **Farm Meats.** Killing, cutting, and curing of farm meats.

3rd Sem. Prerequisites A1 and A2; lecture and lab. 1, 2 hr.; credit 1; fee $2.00.

A57. **Special Study of the Breeds of Dairy Cattle.** Origin, history, and characteristics of the breeds of dairy cattle with special reference to the important strains and families.

3rd Sem. Prerequisites A1 and A2; recitation 1; labs. 2, 1 hr.; credit 2.

A59. **Milk Production and Herd Management.** Practical feeding and management of dairy herd for economical production of milk. A study of feeds and best methods of increasing milk production. Practical problems in feeding and housing.

4th Sem. Prerequisites A5 and A6; recitation 1; lecture and lab. 2; credit 2.

## BACTERIOLOGY

PROFESSOR CUNNINGHAM, Agricultural Engineering Hall, Room 301
Assistant Professor Watts

### Description of Studies

T1. **General Bacteriology and Fermentations.** For students in Home Economics. Bacteria, yeasts, and molds with special reference to their relation to the home, including a brief consideration of the pathogenic forms of bacteria, the fermentations and changes in foods caused by bacteria, yeasts, and molds. Care of the house from the sanitary point of view, heating and lighting, ventilation, water supply, plumbing, drainage, and disposal of waste.

3rd Sem. Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $2.50.

## BOTANY

PROFESSOR CUNNINGHAM, Agricultural Engineering Hall, Room 301
Assistant Professor Watts

### Description of Studies

T1a, b. **Agricultural Botany.** (a) Complete life history of the plant as related to agriculture; seed germination; development of roots, leaves, and stems; the flowering period; production and ripening of fruits and seeds. (b) The work in (a) is supplemented by numerous exercises which may be repeated with simple equipment. For Home Economics students.

(a) 1st Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00. (b) 1st Sem. Recitation 1; lab. 2, 2 hr.; credit 2⅓; fee $1.00.

T2a, b. **Farm Weeds and Seeds.** (a) Injurious weeds, methods used to exterminate them; purity and vitality of agricultural seeds; methods used to detect impurities. State and national laws governing destruction of weeds and restriction and sale of agricultural seeds. (b) The common weeds of the farm, orchard, and garden. Collection of the weeds and their seed. Seed analysis and weed eradication. For Home Economics students.

(a) 1st Sem. Lab. 1, 2 hr.; credit ⅔; fee $1.00. (b) 3rd Sem. Lab. 1, 2 hr.; credit 1; fee $1.00.

T3. **General Botany.** The flower, root, leaf, fruit, and seed and functions of the parts. The economic uses of the parts of plants and their value to the home. For Home Economics students.

2nd Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

T5. **Plant Diseases.** Bacterial and fungous diseases of cultivated plants, including blights, rusts, smuts, mildews, and molds.

3rd Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

T6. **General Botany.** Fundamental principles of plant growth, together with life history of flowering plants.

1st or 3rd Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $2.00.

T7. **Poisonous Weeds.** The common weeds of fields and pastures with special reference to plants responsible for poisoning animals. Herdsmen's Course.

2nd Term. Lecture, lab. 1, 2 hr.; credit ¾; fee $1.00.

## CHEMISTRY

Chemistry Building, General Office, Room 202

Instructors Lancelot, Dunnigan

For description of building and equipment, see page 408.

### Description of Studies

T1. **Elementary Chemistry.** The chemistry of the industries for students of the two-year course in engineering.

1st Sem. Recitations 2; credit 2.

T28. **Dairy Chemistry.** The chemistry of the dairy and creamery for students of the one-year course in dairying.

1st Sem. Recitation 1; lab. 1, 3 hr.; credit 2; fee $3.00.

T31a, b. **Elementary Chemistry.** Chemistry as applied to the household.

1st Sem. (a) Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $3.00. (b) Recitation 2; lab. 2, 2 hr.; credit 3⅓; fee $5.00.

T32. **Chemistry of Foods.** Preparation of certain organic compounds familiar to the household; study of the composition of many of the common foods.

2nd Sem. Prerequisite T31b; recitations 2; lab. 2, 2 hr.; credit 3⅓; fee $5.00.

T33. **Chemistry of Textiles.** An elementary study of the physical and chemical nature of the fiber, the adulteration of fabrics, and the chemistry of cleaning.

3rd Sem. Prerequisite T32; recitation 1; lab. 2, 2 hr.; credit 2⅓; fee $5.00.

T57. **Agricultural Chemistry.** The chemistry of the farm, relating especially to the elements essential to plant life.

Either Sem. Recitation 1; lab. 1, 2 hr.; credit 2; fee $3.00.

## CIVIL ENGINEERING

Office, Chemistry Building, Room 195

### Description of Studies

E0. **Field Engineering.** Measurement of land, staking out foundations, civil divisions.

2nd Sem. Recitation 1; lab. 1, 3 hr.; credit 2; fee $1.50.

E4. **Cement Products.** The uses and physical properties of concrete and concrete materials. Its strength for structural purposes.

2nd and 4th Sem. Recitation 1; lab. 1, 3 hr.; credit 2; fee $3.00.

E10. **Elements of Structures.** The practice of structural design in steel.

4th Sem. Prerequisites M. E. E19, Math. T17, to be taken simultaneously; recitation 1; labs. 2, 3 hr.; credit 3; correspondence fee $3.00.

## DAIRYING

Instructors Ainsworth, Schwark

The one-year course in dairying includes the general work in creamery manufacturing; viz., buttermaking, cheesemaking, ice cream making, and market milk. These branches are operated on a commercial basis every day of the year. The students are required to spend each forenoon in the Dairy Department and carry on this work under supervision of the department instructors. The object is to apply the theoretical knowledge gained in the class room to the practical work in the factory. The laboratory work is very important since it prepares students to be buttermakers, ice cream makers, cheesemakers, market milk men, and owners or operators of plants.

The department is equipped with modern and up-to-date machinery, and affords excellent opportunity for the students to become acquainted with the principles and workings of such machinery.

Men completing this course are usually placed by the Department.

### One-Year Course in Dairying

(For entrance requirements, see page 322)

Upon the completion of this course, together with evidence that the student has operated a creamery or other dairy establishment successfully for one year, the student will be granted a certificate.

| First Semester | Credits[2] |
|---|---|
| Dairy A[1]: Dairy Practice | 6 |
| Dairy A2: Buttermaking | 2 |
| Dairy A3: Milk Testing | 2 |
| Dairy A6: Dairy Bacteriology | 1 |
| Agr'l Engr. A23: Dairy Engineering | 3 |
| A. H. A18: Breeding and Judging Dairy Cattle | 2 |
| Chem. T28: Dairy Chemistry | 2 |
| Phys. Tr. T1 | R[3] |
| Soils A53a: Soils and Fertilizing Materials | 2 |
| | 20 |

| Second Semester | Credits |
|---|---|
| Dairy A4: Dairy Practice | 6 |
| Dairy A8: Cheesemaking | 1 |
| Dairy A102†: Elementary Buttermaking | 1 |
| Dairy A103‡: Elementary Milk Testing | 1 |
| Dairy A20: Factory Management | 2 |
| Dairy A21: Preparation of Ice Cream and Ices | 1⅔ |
| Dairy A26: Judging Dairy Products | 1 |
| Dairy A30: Market Milk | 1 |
| A. H. A19: Feeding and Management of Dairy Cattle | 2 |
| Farm Crops A8a: General Farm Crops Production | 2 |
| Phys. Tr. T2 | R |
| | 18⅔ |

[1] The number refers to the description of the study.
[2] For definition of a credit see page 81
[3] R indicates that the study is required, without credit, for graduation.
† Not required of students who have a credit in A2.
‡ Not required of students who have a credit in A3.

## Description of Studies

A1. **Dairy Practice.** Buttermaking, cheesemaking, ice cream making, pasteurizing of milk and cream, preparing of starters, testing of dairy products, and refrigeration engineering.

1st Sem. Labs. 6, 4 hrs.; credit 6; fee **.

A2. **Buttermaking.** Composition of milk and dairy products, the principles of gravity and centrifugal separation of cream, cream ripening, preparing of starters, churning, and preparing of butter for market.

1st Sem. Recitations 2; credit 2.

A3. **Milk Testing.** The Babcock test; the Farrington and Mann's test for determining acidity; the use of the lactometer for detecting adulterations; the composite sampling and testing of individual cows.

1st Sem. Credit 2; fee **.

A4. **Dairy Practice.** Continuation of A1.

2nd Sem. Labs. 5, 7 hrs.; credit 6; fee **.

A6. **Dairy Bacteriology.**

1st Sem. Credit 1.

A8. **Cheesemaking.** Cheddar, fancy and soft cheese.

2nd Sem. Recitation 1; credit 1.

A10. **Household Dairying.** A study of the production, care, and use of milk and dairy products; their economic and dietetic value for household purposes. Methods of manufacturing butter, different kinds of ice cream, cheese, and milk drinks, etc.

4th Sem. Lecture and laboratory; credit 2; fee $2.50.

A12. **Principles of Dairying.** Secretion and composition of milk; testing of dairy products; separation and care of milk and cream on the farm; cheesemaking, buttermaking, and ice cream making on the farm.

1st Sem. Recitations 2; lab 1, 2 hr.; credit 2⅔; fee $3.00.

A14. **Commercial Dairying.** Milk testing, buttermaking, cheesemaking, and ice cream making. Advanced registry cow testing; market milk and cream; dairy bacteriology; coöperative creamery management.

2nd Sem Prerequisite A12; lecture and lab. 2 hrs.; credit 1; fee $2.50.

A20. **Factory Management.** Underlying principles.

2nd Sem. Recitations 2; credit 2

A21. **Ice Cream and Ices.** Preparation of ice creams, lacto, and ices.

2nd Sem. Recitation 1; lab 1, 2 hr.; credit 1⅔; fee **.

A26. **Judging Dairy Products.** Judging of milk, cream, butter, frozen products, and cheese; special attention to score cards.

2nd Sem. Credit 1; fee **.

A30. **Market Milk.** The different methods used in the preparation of milk and cream for market.

2nd Sem. Credit 1; fee **.

A102. **Elementary Buttermaking.**

2nd Sem. Credit 1; fee **.

A103. **Elementary Milk Testing.**

2nd Sem. Credit 1; fee **.

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** For the subjects A1, A3, A4, A21, A26, A30, A102, and A103 a combined laboratory fee of $10 a semester is charged.

## ECONOMIC SCIENCE

Central Building, Room 223

### Description of Studies

T22. **Rural Economics.** History of agriculture in the United States; the crop areas, livestock areas, imports and exports of agricultural products, markets, land tenure, agricultural organizations, coöperation, and rural social problems.

4th Sem. Recitations 2; credit 2.

T24. **Elementary Social Economics.** Designed to present in a clear, elementary, and practical way the economic and social problems that young women will meet in their every-day life. It will involve, therefore, a practical study of the elementary principles of Economics and Sociology as related to each other, and these as dealing with the civic, industrial, and social life of the individual and society. (Offered for women only.)

4th Sem. Recitations 2; credit 2.

## ELECTRICAL ENGINEERING

INSTRUCTOR CAMPBELL, Chemistry Building, Room 195

### Description of Studies

E1. **Electrical Problems.** The solution of electrical problems which illustrate the principles emphasized in E3.

3rd Sem. Prerequisite E. E. E2; recitations 2; credit 2.

E2. **Elementary Electricity and Magnetism.** The theory of electricity and magnetism.

1st and 2nd Sems. Prerequisite Math. T7; recitations 2; lab. 1, 3 hr.; credit 3; fee $2.00; correspondence fee $8.00.

E3. **Direct and Alternating Current Machinery.** The theory of electricity as applied to electrical machines; operation of electrical machinery.

3rd Sem. Prerequisites Mathematics T7 and T8, E. E. E2; recitations 3; credit 2; correspondence fee $10.00.

E5. **Practical Wiring of Buildings.** Installation of electrical machinery.

3rd Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

E6. **Dynamo Practice.** Practice in the operation and care of dynamo electric machinery; switchboard operation.

4th Sem. Prerequisite E3; labs. 2, 3 hr.; credit 2; fee $5.00.

E7. **Telephony.** Elementary principles of telephone apparatus.

1st Sem. Recitations 3; credit 3.

E8. **Telephony.** Switchboard and telephone circuits; central office exchange and toll maintenance; exchange and toll construction.

2nd Sem. Recitations 2; credit 2.

E9. **Telephone Practice.** Laboratory exercises with telephone apparatus.

1st Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

E10. **Telephone Practice.** Building up and installing switchboard

and telephone circuits; line testing and fault location with testing instruments.

2nd Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

## ENGINEERING

DEAN **MARSTON

DEAN BEYER, Engineering Hall, Room 315

(For Collegiate Courses in Engineering, see page 51.)

The Vocational Courses in Engineering are intended to meet the needs of two classes of men: (a) young men who are engaged in the trades or in some other gainful employment and who desire in the short time at their disposal to fit themselves for some particular work; (b) young men who have not had the time or opportunity to prepare themselves to meet the entrance requirements of the regular four-year courses and who desire to follow some special work related to engineering.

A large number of the individual studies may be taken by correspondence and credit received in the vocational courses. By special arrangement men of exceptional ability may complete a course by taking one year of resident work followed by correspondence study and successful practical experience.

### VOCATIONAL COURSES IN ENGINEERING

**Two-Year Course for Electrical Workers and Stationary Engineers**

(For entrance requirements, see page 322)

Upon the completion of this course, the student will be granted a certificate.

FIRST YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. T1[1]: Elementary Chemistry | 2 | Engl. T20* Elementary Composition | 3 |
| Engl. T19*: The Practice of English | 3 | Math. T5* or T8* or T3*: Algebra or Plane Geometry | 5 |
| Math. T11* or T7* or T3*: Shop Math. or Algebra | 4 or 5 | M. E. E2*: Shop Drawing | 2 |
| M. E. E1*: Shop Drawing | 2 | M. E. E6b: Pattern Work | 1 |
| M. E. E5a: Wood Shop | 1 | M. E. E12*: Steam Boilers | 3 |
| M. E. E9: Shop Work | 1 | Phys. Tr. T2: Gymnasium Work | R |
| Phys. Tr. T1: Gymnasium | R[3] | E. E. E. 2: Elementary Electricity and Magnetism | 3 |
| Phys. T1: Elementary Physics | 3 | Mil. Sci. T2: Military Art | 1 |
| Mil. Sci. T1: Military Art | 1 | | |
| | 17 or 18 | | 18 |

* May be taken by correspondence.
[1] The number refers to the description of the study.
[2] For definition of a credit see page 81.
** On leave of absence for Military Service.

SECOND YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| E. E. E1: Electrical Problems | 2 | E. E. E6: Dynamo Practice | 2 |
| E. E. E3: Direct and Alternating Current Machinery | 3 | Engr. E1: Practical Experience | R |
| E. E. E5: Practical Wiring | 2 | Math. T17*: Plane Trigonometry | 5 |
| Math. T5* or T16*: Plane or Solid Geometry | 3 or 5 | M. E. E11: Machine Shop Work | 1 |
| M. E. E17: Shop Sketching | 2 | M. E. E13: Pipe Fitting | 1 |
| M. E. E8: Machine Shop Work | 2 | M. E. E14*: Heating and Sanitation of Buildings | 4 |
| M. E. E21*: Gas Engines | 2 | M. E. E10: Power Plant Operation | 4 |
| Phys. Tr. T3: Gymnasium Work | R | Phys. Tr. T4: Gymnasium Work | R |
| Mil. Sci. T3: Military Art | 1 | Mil. Sci. T4: Military Art | 1 |
| | 17 or 19 | | 18 |

NOTE: The department reserves the right to substitute equivalent work in the schedule of any student if the enrollment in any one study is not sufficient to warrant conducting a class in that subject.

## Two-Year Course for Mechanical Draftsmen and Mechanicians

(For entrance requirements, see page 322)

Upon the completion of this course, the student will be granted a certificate.

FIRST YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. T1[1]: Elementary Chemistry | 2 | C. E. E4: Cement Products | 2 |
| Engl. T19*: The Practice of English | 3 | Engl. T20*: Elementary Composition | 3 |
| Math. T11* or T7*: or T3*: Shop Math. or Algebra | 4 or 5 | Math. T5* or T8* or T3*: Algebra or Plane Geometry | 4 or 5 |
| M. E. E1*: Shop Drawing | 2 | M. E. E2*: Shop Drawing | 2 |
| M. E. E5a: Wood Shop | 1 | M. E. E6a: Pattern Work | 2 |
| M. E. E9: Shop Work | 1 | M. E. E12*: Steam Boilers | 3 |
| Phys. Tr. T1: Gymnasium | R[3] | Phys. Tr. T2: Gymnasium Work | R |
| Phys. T1: Elementary Physics | 3 | Mil Sci. T2 Military Art | 1 |
| Mil. Sci. T1 · Military Art | 1 | | |
| | 17 or 18 | | 17 or 18 |

* May be taken by correspondence.
[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81
[3] R indicates that the study is required, without credit, for graduation.

SECOND YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Math. T5* or T16*: Plane or Solid Geometry | 3 or 5 | Engr. E1: Practical Experience | R |
| M. E. E17: Shop Sketching | 2 | Math. T17*: Plane Trigonometry | 5 |
| M. E. E21*: Gas Engines | 2 | M. E. E4: Drafting Room Practice | 2 |
| M. E. E3: Drafting Room Practice | 2 | M. E. E11: Machine Shop Work | 1 |
| M. E. E8: Machine Shop Work | 2 | M. E. E13: Pipe Fitting | 1 |
| M. E. E19*: Strength of Materials | 5 | M. E. E14*: Heating and Sanitation of Buildings | 4 |
| Phys. Tr. T3: Gymnasium Work | R | M. E. E16*: Elements of Mechanics | 4 |
| Mil. Sci. T3: Military Art | 1 | Phys. Tr. T4: Gymnasium Work | R |
| | | Mil. Sci. T4: Military Art | 1 |
| | 17 or 19 | | 18 |

NOTE: The department reserves the right to substitute equivalent work in the schedule of any student if the enrollment in any one study is not sufficient to warrant conducting a class in that subject.

## Two-Year Course for Structural Draftsmen and Building Superintendents

(For entrance requirements, see page 322)

Upon the completion of this course, the student will be granted a certificate.

FIRST YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| Chem. T1[1]: Elementary Chemistry | 2 | C. E. E0: Field Engineering | 2 |
| Engl. T19*: The Practice of English | 3 | Engl. T20*: Elementary Composition | 3 |
| Math. T18* or T7* or T3*: Arithmetic and Estimating or Algebra | 4 or 5 | Hort. A12: Landscape Gardening | 1⅔ |
| M. E. E5b: Wood Shop Work | 2 | Math. T5* or T8* or T3*: Algebra or Plane Geometry | 4 or 5 |
| | | Phys. Tr. T2: Gymnasium Work | R |

* May be taken by correspondence.
[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.
[3] R indicates that the study is required, without credit, for graduation.

| | | | |
|---|---|---|---|
| Phys. Tr. T1: Gymnasium Work | R[3] | Str. Des. E2: Drawing | 2 |
| Phys. T1: Elementary Physics | 3 | Str. Des. E4: Freehand Sketching | 1 |
| Str. Des. E1: Drawing | 2 | Str. Des. E8: Building Construction | 2 |
| Mil. Sci. T1: Military Art | 1 | Mil. Sci. T2: Military Art | 1 |
| | 17 or 18 | | 16⅔ or 17⅔ |

SECOND YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| Math. T5* or T16*: Plane or Solid Geometry | 3 or 5 | C. E. E4: Cement Products | 2 |
| M. E. E19*: Strength of Materials | 5 | C. E. E10*: Elements of Structures | 3 |
| Phys. Tr. T3: Gymnasium Work | R | Engr. E1: Practical Experience | R |
| Str. Des. E3: Drawing | 2 | Math. T17*: Plane Trigonometry | 5 |
| Str. Des. E7: Plan Reading and Estimating | 3 | M. E. E14*: Heating and Sanitation of Buildings | 4 |
| Str. Des. E5: Interior Decoration | 3 | Phys. Tr. T4: Gymnasium | R |
| Mil. Sci. T3: Military Art | 1 | Str. Des. E10: Drawing | 2 |
| | | Mil. Sci. T4: Military Art | 1 |
| | 17 or 19 | | 17 |

NOTE: The department reserves the right to substitute equivalent work in the schedule of any student if the enrollment in any one study is not sufficient to warrant conducting a class in that subject.

## Special Part-Time Course for Telephone Men

This is a special part-time course given in coöperation with telephone companies for young men who are (or expect to be) engaged in telephone work. It is open to any young man in the state, but only those detailed by a telephone company are certain of employment when the school work is completed. The course probably will require two years of time alternating school instruction and practical work. Five months each year (May to September inclusive) are to be devoted to practical work at regular wages in the employ of a telephone company, and seven months (October to April inclusive) are to be devoted to school instruction at Ames. If necessary a man may return to field work at the close of the first semester, about February 1, and return the following year to take up his school work at the beginning of the second semester. Men taking this course who are detailed by a telephone company are considered to be in the employ of the telephone company throughout the year, but receive wages only while at work in the field. Regular reports of scholarship and progress will be made to the company concerned.

| First Semester | Credits | Second Semester | Credits |
|---|---|---|---|
| Engl. T19*: The Practice of English | 3 | Engl. T20*: Elementary Composition | 3 |
| E. E. E7: Telephony | 3 | E. E. E8: Telephony | 2 |
| E. E. E9: Telephone Practice | 2 | E. E. E10: Telephone Practice | 2 |
| Math. T7* or T3* or T11*: Algebra or Shop Math. | 4 or 5 | Math. T8* or T11*: Algebra or Shop Mathematics | 4 or 5 |
| M. E. E1*: Shop Drawing | 2 | M. E. E2*: Shop Drawing | 2 |
| M. E. E5a: Wood Shop Work | 1 | M. E. E7: Forge-Work | 2 |
| E. E. E2: Elementary Electricity and Magnetism | 3 | E. E. E3: Direct and Alternating Current Machinery | 3 |
| Phys. Tr. T1: Gymnasium | R | Phys. Tr. T2: Gymnasium | R |
| | 18 or 19 | | 18 or 19 |

NOTE: In this course entering students will be registered at the beginning of the first semester only.

### Description of Studies

PROFESSOR KENNETH G. SMITH, Chemistry Building, Room 194

E1. **Practical Experience.** Coöperative arrangements are now pending whereby a man of ability may receive a certificate for one year of resident work and one year or more of satisfactory practical experience accompanied by correspondence study in one or more subjects.

## ENGLISH

PROFESSOR MACLEAN (absent on leave)
ASSOCIATE PROFESSOR COOPER, Chemistry Building, Room 101
Instructors Fleming, Youtz

### Description of Studies

T1. **The Sentence.** A review of grammar such as would be required in the twelfth grade. It presupposes a knowledge of elementary grammar and includes work in correcting common errors, analysis of good modern prose, and daily drill in sentence construction and original composition.

1st Sem. Recitations 4; credit 4.

T2. **Rhetoric and Composition.** Rapid review of rhetoric and composition. Study of the four forms of discourse with essays on simple themes.

1st or 2nd Sem. Recitations 4; credit 4.

T11. **English Classics.** A study of some of the masterpieces of English literature, both scientific and general. An effort to secure the student's appreciation of what is good, and to create in him a desire for wider reading.

1st or 2nd Sem. Prerequisites T13 and T15 or their equivalents; recitations 3; credit 3.

* May be taken by correspondence.

T12. **English Classics.** Literature for those who have not finished a fully accredited four-year high school course. An approach to a more intelligent and discriminating appreciation of literature, and an incentive to a wider and more thoughtful reading.

1st or 2nd Sem. Recitations 4; credit 4.

T13a, b, **The Practice of English.** Training in note-taking and outlining to aid in general college work. Writing of business letters. Attention to clearness and correctness of expression, both oral and written.

1st or 2nd Sem. (a) Recitations 3; credit 3 (b) 1st Winter Term, 12 weeks. Recitations 3; credit 3.
1st or 2nd Sem. Recitations 3; credit 3.

T14. **English Classics.** To be given in lieu of T12, the only difference being that the classics read shall be other than those read in the preceding course.

1st or 2nd Sem. Recitations 4; credit 4.

T15. **Elementary Composition.** A continuation of T13. More emphasis placed on the theme.

1st or 2nd Sem. Recitations 3; credit 3

T16. **Elementary Grammar.** A working knowledge of the English sentence, its elements, and their relation to each other and to the sentence as a whole.

1st or 2nd Sem. Recitations 3; credit 3.

T17. **Rhetoric and Composition.** A continuation of T13 and T15. Writing of longer themes on subjects pertaining to other college work, and much oral composition.

1st or 2nd Sem. Recitations 3; credit 3.

T18a, b. **The Literature of the Home.** The best literature which everyone should know. Emphasis on the simple narrative poem, the story, the literature which aids in developing or controlling the imagination, and in strengthening the power of clear expression.

(a) 1st or 2nd Sem. Recitations 3; credit 3. (b) 1st Sem. Recitations 2, credit 2.

T19. **The Practice of English.** Similar to T13a.

1st or 2nd Sem. Recitations 3; credit 3.

T20. **Elementary Composition.** A continuation of T19. Similar to T15.

2nd Sem. Recitations 3; credit 3.

T21. **The Informational Article.** Drill in writing such articles as the student will be called upon to prepare for special occasions and, perhaps, for publication.

1st or 2nd Sem. Prerequisite T15, T20, T23, or T17; recitations 2; credit 2.

T22. **The Practice of English.** Similar to T13a.

1st Sem. Recitations 3; credit 3.

T23. **Elementary Composition.** Continuation of T22 Similar to T15.

2nd Sem. Recitations 3; credit 3.

## FARM CROPS AND SOILS

PROFESSOR EICHLING, Agricultural Engineering Hall, Room 312
Assistant Professor Zentmire, Instructor Westley

### Description of Studies

FARM CROPS GROUP

A1. **Corn Production.** Adaptation of the corn plant. Method of selecting, storing, testing, and grading of seed; planting, cultivating, and harvesting; cost of production; uses of the crop; commercial marketing; insects and diseases; field study of corn with reference to the per cent stand and the selection of seed corn; laboratory judging and market grading.

1st Sem Recitations 2, lab 1, 2 hr ; credit 2⅔; fee $1 50

A2. **Small Grain Production.** Oats, winter and spring wheat, barley, and rye; soil and climatic adaptations, seed selection, preparation of seed bed and seeding, harvesting; uses; insects and diseases; judging and market grading.

2nd Sem. Recitations 2; lab 1, 2 hr , credit 2⅔; fee $1 50.

A3. **Grasses and Forage Crops.** Grasses, legumes, and other forage plants suitable for pasture, hay, silage, and soiling; botanical structure; soil and climate adaptation, cultural and harvesting methods; uses; identification of plants, their seeds and common adulterants

4th Sem Prerequisites A1 and A2, recitations 2; credit 2

A7. **Grain Judging and Breeding.** Advanced work in corn and small grain judging to prepare students to judge at corn shows and institutes; advanced work in grain breeding

4th Sem Prerequisites A1 and A2, recitation 1, lab 1, 2 hr.; credit 1⅔; fee $1 50.

A8a, b. **General Farm Crops Production.** (a) Corn and small grain growing; care of pastures and meadows and the production of forage and silage crops. For One-Year Dairy students. (b) Corn, wheat, oats, barley, rye, grasses and legumes; botanical study; cultural methods; judging; testing; uses; diseases and insects. For Home Economics students.

2nd Sem. (a) Recitations 2; credit 2. (b) Recitations 2; lab. 1, 2 hr ; credit 2⅔; fee $1.50.

A9. **Corn and Small Grain.** Growing: Special emphasis on production from the standpoint of feeding livestock. (Herdsman's course.)

Winter Term. Lectures 2; lab. 1, 2 hr ; credit 2; fee $1.00.

A10. **Forage Crops.** Grasses, legumes, and other forage crops suitable to Iowa conditions. (Herdsman's course.)

Winter Term. Lecture 1; lecture lab. 1, 2 hr.; credit 1½; fee $1.00.

SOILS GROUP

A51. **Soil Physics.** Origin, formation, and classification of soils; moisture, temperature, and aeration in soil together with the conditions

influencing these factors; preparation of the seed bed; cultivation and working of the soil; drainage; treatment of alkali, gumbo, and peat.

3rd Sem. Prerequisites F. C. A1 and A2; recitations 2; lab. lecture 1, 2 hr.; credit 3; fee $1.00.

A52. **Soil Fertility.** Maintenance of fertility; influence of commercial fertilizers; the effect of barnyard manure and green manure on the quality and yield of various crops; the effect of different crops upon the fertility of the soil; different systems of rotation; influence of organisms upon the fertility of the soil.

4th Sem. Prerequisites F. C. A1 and A2; recitations 2; lab. and lecture 1, 2 hr.; credit 3; fee $1.50.

A53a, b. **Soils.** (a) General study of soils; preparation and handling of soils; soil organisms, humus, plant food, fertilizers, manures, and crop rotation. For One-Year dairy students only. (b) General study of soils; formation and classification; preparation and handling; humus; plant food and crop rotation. For Home Economics students.

(a) 1st Sem. Recitations 2; credit 2. (b) 3rd Sem. Recitations 2; lab. 1, 2 hr.; credit 2⅔; fee $1.00.

A55. **Garden Soils.** From the standpoint of the city gardener. Six weeks Garden Club Leaders Course.

Winter Term. Lecture lab. 1, 2 hr.; credit 1; fee $1.00.

## FARM MANAGEMENT

PROFESSOR EICHLING, Agricultural Engineering Hall, Room 312
Assistant Professor Zentmire

### Description of Studies

A1. **Farm Management.** Farming as a business; factors controlling successful management of farms in Iowa; types of farming, farm layout, establishment of rotation, handling of labor and marketing of products; management and organization of the home farm.

3rd Sem. Prerequisites F. C. A1 and A2, Farm Man. A2; recitations 2; lab. and lecture 1, 2 hr.; credit 3; fee $1.00.

A2. **Farm Accounts.** Systems of bookkeeping adapted to farm conditions; farm arithmetic.

1st or 2nd Sem. Recitation and lab. 2 hrs.; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

## HISTORY

INSTRUCTOR ———, Central Building, Room 206

### Description of Studies

T2. **Advanced American History.** A rapid review of the colonial period, followed by a study of the national period from the Revolution to the present time. Special attention is given to economic history. This course corresponds to work in American history offered in the fourth year of accredited high schools.

1st or 3rd Sem. Prerequisite, one year of ancient and medieval or modern history; recitations 4; credit 4.

## HOME ECONOMICS

DEAN MACKAY, Home Economics Building, Room 105
Associate Professor and Director Ferguson; Instructors Hawkes, Russell, Rebok

(For Collegiate Course in Home Economics, see page 216.)

The two-year Home Economics course is planned to meet the needs of young women who are interested in home problems or those who wish to earn a livelihood in such work.

The course aims to dignify all occupations of the home by placing them upon a scientific and aesthetic basis, preparing girls for the duties and responsibilities of the home, giving them a broader view of life and a knowledge and training that will enable them to meet home conditions in a thoroughly practical and capable manner. It is possible for graduates of this course to use their education to some definite purpose. The training is such that young women will be able to obtain positions as tea room managers, caterers, dressmakers, milliners, demonstrators, unaccredited and rural school teachers, farm managers.

Each subject is planned in progressive sequence throughout the four semesters. A high standard of work is maintained. A systematic and proportionate use of time for study is insisted upon. Certain specific subjects may be credited toward entrance requirements for the four-year course.

The lecture rooms and laboratories are in the Home Economics and Chemistry Buildings. A dining room and cooking laboratory are situated on the third floor of the Home Economics Building, and a sewing and textile laboratory and an applied design laboratory on the first floor of the Chemistry Building. Lockers are provided for the students in the department.

The related science and other required work is given in the laboratories of the various departments of the College.

NOTE: Beginning courses in Home Economics are offered in both semesters so that students can enter at the beginning of either semester.

### Two-Year Course in Home Economics

(For entrance requirements, see page 322)

FIRST YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| H. Ec. H1[1]: Food Study and Preparation | 3⅓ | H. Ec. H5: Food Study and Preparation | 3⅓ |
| H. Ec. H2: Garment Making and Handwork | 2⅓ | H. Ec. H6: Dressmaking | 2⅓ |
| H. Ec. H3: Textiles | 1⅔ | H. Ec. H7: Textiles | 1⅔ |
| | | H. Ec. H8: Applied Design | 1⅓ |

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.

| | | | |
|---|---|---|---|
| H. Ec. H24: Physiology and Personal Hygiene | 2 | Chem. T32: Chemistry of Foods | 3⅓ |
| Chem. T31b: Elementary Chemistry | 3⅓ | Engl. T23: Elementary Composition | 3 |
| Engl. T22: The Practice of English | 3 | Phys. Cul. T2: Light Apparatus | R |
| Phys. Cul. T1: Elementary Gymnastics | R[3] | Electives | 2 |
| Electives | 1 | | |
| | 16⅔ | | 17 |

SECOND YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| H Ec. H9. Food Study and Preparation | 3⅓ | H. Ec. H14· General Cookery | 2⅓ |
| H Ec H10: Dressmaking | 2⅓ | H Ec. H17 Millinery and Dressmaking | 2⅓ |
| H Ec H11: Costume Design | 1⅓ | H. Ec H18: Home Decoration and Furnishing | 1⅔ |
| H Ec. H12 Art Appreciation | 2 | H. Ec. H20. Household Management | 1⅔ |
| H. Ec H25· Physiology and Home Nursing | 2 | H Ec 65· Practice House | R |
| Bact. T1· Bacteriology and Fermentations | 2⅓ | Dairy A10: Household Dairying | 2 |
| Engl. T18a: Literature of the Home | 3 | Hort. A10: Small Fruits and Vegetables | 1⅔ |
| Phys. Cul. T3, 5 or 7: Advanced Gymnastics | R | Psych T1· Child Study | 2 |
| | | Electives | 2⅓ |
| | 16⅓ | | 16 |

## Two-Year Combined Course in Home Economics and Agriculture

(For entrance requirements, see page 322)

FIRST YEAR

| First Semester | Credits[2] | Second Semester | Credits |
|---|---|---|---|
| H. Ec. H1[1]: Food Study and Preparation | 3⅓ | H Ec. H5: Food Study and Preparation | 3⅓ |
| H. Ec. H2: Garment Making and Handiwork | 2⅓ | H Ec. H6: Dressmaking | 2⅓ |
| Engl. T22: The Practice of | | A. H. A12b: Poultry Management | 1⅔ |

[1] The number refers to the description of the study.
[2] For definition of a credit, see page 81.
[3] R indicates that the study is required, without credit, for graduation.

| | | | |
|---|---|---|---|
| English | 3 | F. C. A8b: Farm Crops Production | 2⅔ |
| Chem. T31a: Elementary Chemistry | 1⅓ | Hort. A15: Elementary Horticulture | 1⅓ |
| H. Ec. H24: Physiology and Personal Hygiene | 2 | Engl. T23: Elementary Composition | 3 |
| Bot. T1b: Agricultural Botany | 2⅓ | Phys. Cul. T2: Light Apparatus | R |
| Phys. Cul. T1: Elementary Gymnastics | R[3] | Electives | 2 |
| Electives | 2 | | |
| | 16⅔ | | 16⅔ |

SECOND YEAR

| Third Semester | Credits | Fourth Semester | Credits |
|---|---|---|---|
| H. Ec. H9: Food Study and Preparation | 3⅓ | *H. Ec. H26: Trade Dressmaking | 1⅓ |
| H. Ec. H10 Dressmaking | 2⅓ | H Ec. H20: Household Management | 1⅓ |
| Engl. T18b: Literature of the Home | 2 | H Ec 65: Practice House | R |
| M. E. E5a: Manual Training | 1 | H Ec. H18: Home Decoration and Furnishing | 1⅓ |
| A. H. A1b: Animal Husbandry | 1⅓ | M E. E5b: Manual Training | 2 |
| Soils A53b: Soils | 2⅔ | A H A2b Animal Husbandry | 1⅓ |
| Bot. T2b: Farm Weeds and Seeds | 1 | Dairy A10: Household Dairying | 2 |
| Phys. Cul. T5: Rural Recreation | R | Electives | 6 |
| Electives | 2 | | |
| | 16 | | 16⅓ |

## Description of Studies

H1. **Food Study and Preparation.** Skill and efficiency in handling materials, utensils, stoves, fuels; systematic work in the kitchen. Fuels: origin, cleanliness, cost. Utensils comparison of materials used and cost. Foods considered as to their source, manufacture, classification, composition, cost, and their function in the body. Practice cooking.

1st Sem. Recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.

H2. **Handwork and Garment Making.** Fundamental sewing stitches on sewing apron; patching and darning; use and adjustment of sewing machine and its attachments Altering commercial patterns to measurements. Two cooking laboratory aprons and underwear; advantages of

[3] R indicates that the study is required, without credit, for graduation.

chosen design. Emphasis on economical placing of pattern, methods of making and finishing. Estimate of cost. Students provide materials subject to approval.

1st Sem. Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.

H3. **Textiles.** Arts and industries of primitive people, development of spinning and weaving, modern processes of manufacture; the growth, preparation and manufacture of cotton and linen; identification of samples of cotton and linen, prices, widths, weaves, design and uses.

1st Sem. Recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

H5. **Food Study and Preparation.** The five food constituents; composition, manufacture, classification, digestion, economic and food value of foods; special foods; menus; table manners, table setting, meal serving, and care of the dining room.

2nd Sem. Prerequisite H1; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.

H6. **Dressmaking.** Accurate measurement, preparation and use of dress form, comparison of drafted and commercial patterns. Planning, cutting, fitting and finishing of two cooking laboratory dresses, a light weight wool dress and a lingerie dress. Study choice of materials, suitable designs and cost. Care and repair of garments.

2nd Sem. Prerequisite H2; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.

H7. **Textiles.** Continuation of H3. Study of wool and silk; physical tests for adulterations; economic conditions; making of clothing budget.

2nd Sem. Prerequisite H3; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

H8. **Applied Design.** The principles of design, including color, drawing; block printing and embroidery in problems in lettering, monogram, border design on huck towel, appliqué design in colored silk, block printing on pongee with emphasis on materials.

2nd Sem. Labs. 2, 2 hr.; credit 1⅓; fee $1.50.

H9. **Food Study and Preparation.** Food preservation and pure food laws; canning fruit, preserving, jellying, and pickling; planning meals for an average family, on limited income; preparing and serving informal dinners; marketing and market prices.

3rd Sem. Prerequisite H5; recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $4.00.

H10. **Dressmaking.** A plain shirt waist or blouse, a linen dress, a renovated dress, and a silk gown. Stock patterns altered to measurements and adapted. Principles of drafting. Modeled pattern on dress form used. Study of materials, material combination and lines of design appropriate to wearer. Dresses fitted on dress form. Estimate of cost. Closely correlated with applied design and costume design. Students provide material subject to approval.

3rd Sem. Prerequisites H6, H8; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.

H11. **Costume Design.** Application of art in dress, study of line, mass and color suitable to individual; appropriate dress for different occasions; texture, color and design in materials. Designs for costumes made in dressmaking classes developed in drawing, painting and modeling on the dress form.

3rd Sem. Prerequisite H8; labs. 2, 2 hr.; credit 1⅓; fee $1.50.

H12. **Art Appreciation.** Principles of design applied to painting, sculpture, architecture, handicraft; historic schools of art including modern English, French and American. Note books, reports of observations and outside reading required.

3rd Sem. Recitation 2; credit 2.

H14. **General Cookery.** Application of principles taught; special lessons in more elaborate cooking processes; preparation of suitable food for the convalescent; arrangement of invalid trays; diet in disease.

4th Sem. Prerequisite H9; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $4.00.

H16. **Foods.**

3rd Sem. Prerequisite H5; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.50.

H17. **Millinery and Dressmaking.** Paper patterns, bucram and willow frames. Selecting, preparing, altering and covering commercial frames. Use of glue and stitches. Velvet, satin, sport, and lace hats made. Trimmings such as folds, pleatings, bows, and flowers including violets, berries, sweet peas, roses. Renovation of hat materials. Designing and making graduating dress. Students provide material subject to approval.

4th Sem. Prerequisite H10, H11; recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.

H18. **Home Decoration and Furnishing.** The exterior of the house, choice of site, floor plan, economy of arrangement; consideration of walls, floors, windows, furniture, pictures and ornament from standpoint of design and cost; pencil drawings, handling of materials, and reports of observation.

4th Sem. Prerequisite H12; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

H20. **Household Management.** Principles and processes included in care of the house; budgets, division of labor, problems involved in care and renovation of textiles, woods, metals.

4th Sem. Prerequisite H3, H7, Chem. T32; recitation 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

H24. **Physiology and Personal Hygiene.** Structure and functions of the human body, and the laws governing health. Proper care of the human body, clothing, and surroundings based upon the principles of human physiology.

1st Sem. Recitations 2; credit 2.

H25. **Physiology and Home Nursing.** Continuation of physiology work in H24, including care during slight illness where the services of a trained nurse are not required; the simplest rules and remedies to be used in the care of the sick, and some general directions regarding the nourishment that should be given during convalescence; care and ventilation of the room, bathing, dressing, bandaging, bedmaking, lifting helpless patients; remedies to be used in case of emergencies while waiting for the physician; the care of children with reference to their feeding and clothing.

3rd Sem. Prerequisite H24; recitations 2; credit 2.

H26. **Trade Dressmaking.** Principles of designing garments and taking measurements for other people. Uses of patterns, economical use

of materials; cutting, fitting, and finishing garments. Cotton, wool, silk garments made. Customers solicited.

**4th Sem. Prerequisite H10; labs. 2, 2 hr.; credit 1⅓; fee $1.00.**

H27. **Drawing and Handiwork for Teachers.** Simple free hand drawing, paper cutting, paper tearing, simple problems in construction, weaving and basketry suitable for rural or graded school problems.

**4th Sem. Labs. 2, 2 hr.; credit 1⅓; fee $1.00.**

## HORTICULTURE

PROFESSOR CUNNINGHAM, Agricultural Engineering Hall, Room 301
Assistant Professor Overley; Instructor ———

The Horticultural Department is well equipped with class rooms, laboratories, orchards, home and cold storage plants, gardens, truck crop outfit for overhead irrigation, and greenhouses of over 30,000 square feet of glass. All of this is available for thorough instruction of students.

### Short Course for Garden Club Leaders

With the increased interest in vocational education, particularly in gardening lines, has come a demand for vocational courses in which the student may secure specialized work.

*A six weeks course, beginning in January*

The Six-Weeks Course is designed primarily for training garden club leaders, and the studies, laboratory work, and conferences are arranged with this thought in view This course will also be of great value to those who wish to take short intensive study in the principles underlying successful gardening

*Admission.* For requirements for admission see p 322.

### Six Weeks Course for Garden Club Leaders

Upon completion of this course and evidence of six months subsequent successful experience (Agr. A5), the student will be granted a certificate.

| | |
|---|---|
| Ag. Eng A9 | Horticultural Machinery |
| Bot. T5 | Plant Diseases and Insects |
| Hort. A9 | Household Plants |
| Hort. A4 | Vegetable Gardening |
| Hort. A22 | Club Gardening |
| Soils A55 | Garden Soils |
| Hort. A23 | Horticultural Seminar |

### Description of Studies

A1. **Plant Propagation.** Reproduction in plants by spores, seeds, and buds. Seed storage and planting; grafting, budding, and layering. A nursery is maintained to grow the material prepared by the student.

**2nd and Winter Sem. Lab. 1, 3 hr; credit 1; fee $1.00.**

A3. **Fruit and Vegetable Growing.** The soils, location, and varieties adapted to fruit and vegetable growing; pruning, spraying, soil manage-

ment, picking, packing, storage, and marketing of fruit and vegetables. This study is arranged with special reference to the Iowa farm orchard and garden.

2nd and Winter Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

A4. **Vegetable Gardening.** The most important factors, such as soil, labor, markets, transportation and storage connected with the growing and marketing of truck crops in Iowa.

Winter Sem. Lecture and lab. 2, 2 hr.; credit 2; fee $1.00.

A6. **Orchard Practice.** Special field work in farm orchards. Practice in planning and planting new orchards, rejuvenation of old orchards and vineyards, winter and summer pruning, spraying and top working of mature trees.

2nd Sem. Lab. 1, 3 hr.; credit 1; fee $1.00.

A7. **Fruit and Vegetable Products.** By-products of the orchard and garden; canning and dehydrating of fruits and vegetables; grape juice, sweet cider and other fruit juices; fruit syrups and vinegars.

3rd and Winter Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

A9. **Household Plants.** Selection, propagation, and care of flowering and foliage plants for the house, lawn, and garden. For Home Economics students.

1st Sem. Lab. 2, 2 hr.; credit 1⅓; fee $1.00.
Six weeks' course — no credit.

A10. **Small Fruits and Vegetables.** Their selection, propagation, cultivation, and care; small fruits with special reference to the farm garden. For Home Economics students.

4th Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee 50c.

A12. **Practical Landscape Development.** Planning and planting of school grounds, streets, parks, vacant lots, and school gardens.

4th Sem. Rec. 1 hr.; lab. 2 hr.; credit 1⅔; fee $1.00.

A13. **Greenhouse Crops.** Selection, propagation, potting, watering, and general management of winter forced plants and flowering plants for show, house, and landscape purposes.

1st Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

A14. **Trees and Ornamentals.** Trees and shrubs for ornamental purposes, lawns, drives; for utility, windbreaks and shelter belts; for revenue, farm woodlots and plantations; identification of common trees and their uses; preservation of posts and timber.

4th Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

A15. **Elementary Horticulture.** Four lines of work are here briefly considered: (1) Fruit growing including both small and tree fruits. (2) Flower growing including house plants, outside gardens, and window boxes. (3) Arrangement of home grounds. (4) Vegetable growing. Raising vegetables for home and market and work in the school gardens. For Home Economics students.

2nd Sem. Rec. 1; lab. 1, 2 hr.; credit 1⅔; fee $1.00.

A22. **Club Gardening.** Study, discussion and practice in garden management, with particular reference to school and vacant lot gardening.

Six Weeks' Course. Recitation 5.

A23. **Horticultural Seminar.**

Six Weeks' Course.

## MATHEMATICS

INSTRUCTOR HERR, Chemistry Building, Room 282
Instructor Iverson

### Description of Studies

T3. **Algebra Review.** This study covers all fundamental principles up to and including radicals and quadratics. The study is intended primarily for students who, having taken elementary algebra in the high school, need a thorough review before entering advanced work, but it may be taken by students who show evidence of a thorough knowledge of algebra through simple equations and at least a brief course through radicals.

Either Sem. Recitations 4 or 5; credit 4 or 5; correspondence fee $10 for 20 lessons.

T5. **Plane Geometry.** Fundamental definitions and axioms, theorems relating to rectilinear figures and the circle, measurement of angles; doctrine of limits; theory of proportion; similar polygons; comparison and measurement of the surfaces of rectilinear figures; measurement of the circle, and geometrical construction of plane figures.

Either Sem. Prerequisite T7; recitations 5; credit 5; correspondence fee $10 for 20 lessons.

T6. **Solid Geometry.** Properties of planes, diedral and polyedral angles, prisms, pyramids, cylinders, cones, and spheres; spherical triangles and spherical polygons.

2nd Sem. Prerequisite, plane geometry; recitations 2; credit 2.

T7. **Algebra to Simple Equations.** This subject, being designed for students who have had no previous work in algebra, takes up thoroughly the fundamental concepts of algebraic processes. It begins with the treatment of Simple Equations of an elementary type with special correlation to the work of the two-year courses in Engineering; then follows a presentation of the following subjects: Addition, Subtraction, Multiplication, Division, Factoring, Highest Common Factor, Lowest Common Multiple, and Fractions.

1st Sem. Recitations 5; credit 5; correspondence fee $10 for 20 lessons.

T8. **Algebra, Simple Equations Through Simultaneous Quadratic Equations.** Simple equations with one or more unknown quantities, Involution, Evolution, Radicals, Quadratic Equations with one and two unknown quantities. Under both simple and quadratic equations, many applied problems are given.

2nd Sem. Prerequisite T7; recitations 5; credit 5; correspondence fee $10.00 for 20 lessons.

T9. **Vocational Mathematics.** For Two-Year Home Economics students only. Those principles of Arithmetic and Algebra which are needed

in the practical problems of Domestic Science, Domestic Art, and Chemistry as given in the Two-Year Home Economics course.

1st Sem. Recitations 3; credit 1.

T11. **Shop Mathematics.** Practical applications of arithmetic, elementary algebra, geometry, and trigonometry to such problems as industrial workers will ordinarily be called upon to solve.

1st or 2nd Sem. Recitations 4; credit 4. In two parts; correspondence fee, part 1, $10.00; part 2, $10.00.

T16. **Solid Geometry.** Same as T6.

Either Sem. Recitations 3; credit 3; in 20 lessons, correspondence fee $10.00.

T17. **Plane Trigonometry.** The student is first given a careful review of algebra. This is followed by a study of trigonometry applied especially to the solution of plane triangles.

2nd Sem. Recitations 5; credit 5; in 20 lessons, correspondence fee $10.00.

T18. **Arithmetic and Estimating.** Practical applications of arithmetic and elementary geometry to such problems as the builder will be called upon to solve. Practice in building estimating.

1st Sem. Recitations 4; credit 4; correspondence fee, part 1, $8.00.

## MECHANICAL ENGINEERING

Office, Chemistry Building, Room 195

### Description of Studies

E1. **Shop Drawing.** Use of instruments in construction of plane curves; free-hand lettering. Detail and assembly drawing.

1st Sem. Lab. 2, 3 hr.; credit 2; correspondence fee $10.00.

E2. **Shop Drawing.** Advanced drawing, including gears, pipe systems, cabinet and isometric drawing.

2nd Sem. Prerequisite E1; labs. 2, 3 hr.; credit 2; correspondence fee $10.00.

E3. **Drafting Room Practice.** Detail drawing of simple machines. The work is carried on in accordance with modern drafting room practice.

3rd Sem. Labs. 2, 3 hr.; credit 2.

E4. **Drafting Room Practice.** Continuation of E3. Problems in elementary design. Practice in detail drawing from designer's sketches and notes.

4th Sem. Labs. 2, 3 hr.; credit 2.

E5a. **Shop Work.** Wood work. Use, sharpening, and adjustment of hand tools; elementary framing and joinery; wood turning.

1st Sem. Lab. 1, 3 hr.; credit 1; fee $2.00.

E5b. **Shop Work.** Wood work. Use, sharpening, and adjustment of hand tools; elementary framing and joinery; wood turning.

1st Sem. Labs. 2, 3 hr.; credit 2; fee $4.00.

E6a. **Shop Work.** Cabinet making and pattern work. Use of power tools, lathes, saws, jointers, mortisers, and trimmers. Principles of pattern making, shrinkage, glueing, and sizing.

2nd Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

E6b. **Shop Work.** Cabinet making and pattern work. Use of power tools, lathes, saws, jointers, mortisers, and trimmers. Principles of pattern making, shrinkage, glueing, and sizing.

2nd Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

E7. **Shop Work.** Forging. Practice in forging work. Structure of iron and steel and effects of heat treatment.

1st or 2nd Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

E7a. **Shop Work.** Forging. Same as E7.

1st or 2nd Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

E8. **Shop Work.** Machine work. Use of hand tools, chipping, filing, and scraping; operation and management of power tools, lathes, shaper, drill press, etc.

3rd Sem. Labs. 2, 3 hr.; credit 2; fee $5.00.

E9. **Shop Work.** Foundry. Moulding in green and dry sand, core making, casting in iron, brass, mixtures and alloys.

1st Sem. Lab. 1, 3 hr.; credit 1; fee $2.00.

E10. **Power Plant Operation.** The operation and management of steam boilers, gasoline and oil engines, and gas producers. The duties of the stationary engineer.

4th Sem. Recitations 3; lab. 1, 3 hr.; credit 4; fee $3.00.

E11. **Shop Work.** Machine work. The use of hand and power tools, lathes, shaper, and drill press.

4th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

E12. **Steam Boilers.** A descriptive and problem study in steam boilers. Types, combustion, methods of firing, and inspection.

2nd Sem. Recitations 3; credit 3; correspondence fee $10.00.

E13. **Shop Work.** Pipe fitting. Practice in steam fitting and electric conduit work, varying same to suit the needs of the student.

4th Sem. Lab. 1, 3 hr.; credit 1; fee $3.00.

E14. **Heating and Sanitation of Buildings.** Practice in the subject of heating and ventilation as applied to private dwellings, schools, and other public buildings, followed by a study of plumbing and sanitation.

4th Sem. Recitations 3; lab. 1, 3 hr.; credit 4; given by correspondence in two parts: part 1, Heating and Ventilation, fee $10.00; part 2, Plumbing and Sanitation, fee $8.00.

E16. **Elements of Mechanics.** Elementary study in the theory of statics, resolution of forces, dynamics, elasticity, and the mechanics of fluids.

4th Sem. Recitations 4; credit 4; correspondence fee $10.00.

E17. **Shop Sketching.** Free hand sketching of machine parts.

3rd Sem. Labs. 2, 3 hr.; credit 2; correspondence fee $8.00.

E18. **Heat.** The nature of heat, Boyle's law, heat engines, thermal efficiencies, refrigeration.

Either Sem. Prerequisites Math. T7 and T8 and Physics T1; recitations 3; credit 3; correspondence fee $10.00.

E19. **Strength of Materials.** The stresses in structures, elastic limit,

and ultimate strength; properties of materials, beams, columns, shafts, riveted joints, concrete reinforcing.

3rd Sem. Prerequisite Math. T3; recitations 5; credit 5; correspondence fee $12.00.

E21. **Gas Egnines.** The fundamental principles and operation of gas, gasoline, and oil engines.

3rd Sem. Recitation 1; lab. 1, 3 hr.; credit 2; fee $2.00; correspondence fee $5.00.

E22. **Automobile Operation.** A study of the modern motor car. Construction and care of the different units of the motor car.

1st or 3rd Sem. Lectures 2; credit 1.

E23. **Automobile Practice.** Practical care, repair and adjustment of the different parts of various types of motor cars.

1st or 3rd Sem. Accompanied or preceded by M. E. E22. Lab. 1, 3 hr.; credit 1; fee $2.00.

## MILITARY SCIENCE AND TACTICS

GENERAL LINCOLN, Transportation Building, Room 203

### Description of Studies

T1. **Military Art.**

1st Sem. Drills 2; required; lecture 1; credit 1.

T2. **Military Art.**

2nd Sem. Prerequisite T1; drills 2; required; lecture 1; credit 1.

T3. **Military Art.**

3rd Sem. Prerequisite T2; drills 2; required; lecture 1; credit 1.

T4. **Military Art.**

4th Sem. Prerequisite T3; drills 2; required; lecture 1; credit 1.

## PHYSICAL CULTURE

Office, Women's Gymnasium, Margaret Hall

### Description of Studies

T1. **Elementary Gymnastics.**

1st Sem. Required. Fee $2.00.

T2. **Light Apparatus.**

2nd Sem. Required. Fee $2.00.

T3, 5 or 7. **Advanced Gymnastics.**

3rd Sem. Required. Fee $2.00.

T12. **Remedial Gymnastics.**

1st, 2nd, 3rd Sem. Required of all students who have need of remedial work.

## PHYSICAL TRAINING (For Men)

Office, Gymnasium, Room 202

### Description of Studies

T1. **Hygiene and Physiology.** Elementary floor tactics; elementary calisthenics; elementary gymnastics; swimming; outdoor and indoor games and athletics. Efficiency lectures.

1st Sem. 2 hours required.

T2. Continuation of T1.
**2nd Sem. 2 hours required.**

T3. Continuation of T2.
**3rd Sem. 2 hours required.**

T4. Continuation of T3.
**4th Sem. 2 hours required.**

T5. **Theory and Practice of Coaching.** Theory of Play; sportsmanship, rules, training; physiology; anatomy, hygiene; actual competition, actual coaching.
**3rd Sem. Lecture 1; lab. 2, 2 hr.; credit 2⅓.**

T6. **Theory and Practice of Coaching.** Continuation of 5.
**4th Sem. Lecture 1 hr.; lab. 2, 2 hr.; credit 2⅓.**

## PHYSICS

Office, Chemistry Building, Room 195
Instructor Little

### Description of Studies

T1. **Elementary Physics.** Mechanics, heat, electricity, and magnetism.
**1st and 2nd Sem. Recitations 3; credit 3**

## PSYCHOLOGY

Office, Central Building, Room 212

### Description of Studies

T1. **Child Study.** Various features of a child's mental growth and development. Instincts and feelings of the child that need to be understood by the teacher and parent.
**4th Sem. Credit 2.**

## PUBLIC SPEAKING

INSTRUCTOR SEMMONS, Central Building, Room 308

### Description of Studies

T2. **Public Speaking.** To help the student get command of himself. Voice building and bodily expression; besides this technical work, students are assigned individual selections for practice, and are met for private rehearsal at regular intervals.
**1st, 2nd, 3rd or 4th Sem. Recitation 1; credit 1.**

T3. **Public Speaking.** Advanced extemporaneous work, requiring longer preparation.
**1st, 2nd, 3rd or 4th Sem. Prerequisite T2; recitation 1; credit 1.**

T4. **Public Speaking.** Preliminary work in Argumentation and practice in debating.

3rd or 4th Sem. Prerequisite T2; recitation 2; credit 2.

## SOILS

For Description of Studies see Farm Crops and Soils, page 343.

## STRUCTURE DESIGN

INSTRUCTOR ANDERSON, Chemistry Building, Room 195

### Description of Studies

E1. **Drawing.** Elementary study as applied to building.

1st Sem. Labs. 2, 3 hr.; credit 2.

E2. **Drawing.** A study of the modern dwelling house. The student is expected to make complete working drawings for a simple house.

2nd Sem. Labs. 2, 3 hr.; credit 2.

E3. **Drawing.** Rendering, the wash drawing, water color work, and perspective.

3rd Sem. Labs. 2, 3 hr.; credit 2.

E4. **Free-Hand Sketching.** Practice in free-hand sketching for the structural draftsman.

2nd Sem. Lab. 1, 3 hr.; credit 1.

E5. **Plan Reading and Estimating.** A complete estimate of a modern house.

3rd Sem. Recitations 3; credit 3.

E7. **Ornament and Design.** Brief study of the history of architecture. A study of the orders of architecture and the use of architectural ornament.

3rd Sem. Recitation 1; labs. 2, 3 hr.; credit 3.

E8. **Building Construction.** Writing of building specifications; methods of building construction.

2nd or 4th Sem. Recitations 2; credit 2.

E10. **Drawing.** The student is expected to work out a complete problem in architectural composition.

4th Sem. Labs. 2, 3 hr.; credit 2.

## VETERINARY MEDICINE

*ASSISTANT PROFESSOR GUARD, Veterinary Building, Room 107

### Description of Studies

T2. **Horse-shoeing and Obstetrics.** Gross anatomy of the foot, and the foot in its relation to the entire limb; shoeing healthy and diseased feet, and shoeing for regular and irregular or faulty gaits. Physiological obstetrics, evolution, fecundation, sterility, gestation, hygiene of pregnant animals and parturition.

3rd Sem. Recitations 2; credit 2.

* On leave of absence for Military Service.

**T3. Farm Sanitation and Communicable Diseases.** General consideration of the causes of diseases and spread; disinfectants and their application; general hygiene and stable sanitation, including drainage and selection of site. For Herdsmen.

1st Term. Recitation 2; credit 2.

**T4. Obstetrics.** Hygiene of pregnant animals and care of new-born animals. For Herdsmen.

2nd Term. Recitation 2; credit 1½.

## ZOOLOGY—APICULTURE

Within the past few years beekeeping has developed from an uncertain side line in agriculture to a specialized business. The opportunities to young men with limited capital are numerous. Competition is less keen than in many other lines of agriculture, yet the annual returns from an apiary should average at least twenty-five per cent of the capital invested. Specialists in beekeeping need only spend from five to seven months a year working in the apiary, leaving the balance of the year for other work.

Besides the opportunities for the commercial beekeeper, there is a growing demand for investigators and teachers. Men trained to fill such positions are few and thus far the demand exceeds the supply.

### One-Year Course in Beekeeping

Upon completion of the course a certificate will be granted.

| First Semester | Credits | Second Semester | Credits |
|---|---|---|---|
| Zoo. T402: Gen. Apiculture | 4 | Zoo. T404: Gen. Apiculture | 4 |
| Zoo. T403: Com. Apiculture | 3 | Zoo. T405: Com. Apiculture | 3 |
| Zoo. T7: Gen. Entomology | 3⅓ | Bact. T2: Bee Diseases | 2 |
| Bot. T6: Gen. Botany | 1⅔ | Bot. T7: Flower Ecology | 1⅔ |
| Bact. T1: Gen. Bact. & Ferm. | 2⅓ | Hort. A6: Orchard Practice | 1 |
| Electives | 2⅔ | Hort. A10: Small Fruits and Veg. | 1⅔ |
| Mil. Sci. T1: Military Art | 1 | Mil. Sci. T2: Military Art | 1 |
| P. T. 1: Physical Training | R | P. T. 2: Physical Training | R |
| | | Electives | 3⅔ |
| | 18 | | 18 |

### Description of Studies

**T402. General Apiculture.** Life history, habits, anatomy, physiology, and development of the honey bee. Literature on bees and beekeeping.

1st Sem. Recitations 2; labs. 2, 3 hr.; credits 4; fee $3.00.

**T403. General Apiculture.** Continuation of 402. Modern methods of practice in apiculture; sources of nectar and pollen; manipulation of the colony.

2nd Sem. Recitations 2; labs. 2, 3 hr.; credits 4; fee $3.00.

T404. **Commercial Apiculture.** History of Beekeeping; location of apiary; rendering beeswax; manufacture and use of comb foundation; assembling supplies, use of apparatus; fall management and methods of wintering; preparation and marketing of the honey crop.

1st Sem. Recitations 2; lab. 1, 3 hr.; credits 3; fee $3.00.

T405. **Commercial Apiculture** continued; systems of management for the production of comb and extracted honey; commercial queen rearing; transferring bees; swarm control; symptoms and treatment of bee diseases.

2nd Sem. Recitations 2; lab. 1, 3 hr.; credits 3; fee $3.00.

# Summer Session

Raymond A. Pearson, President, Central Building.
E. W. Stanton, Acting President, Central Building.
Herman Knapp, Treasurer and Registrar, Central Building.
G. M. Wilson, Director, Agricultural Hall, Room 318.

SUMMER SESSION COUNCIL

President Pearson, Acting President Stanton, Deans Curtiss, Beyer, Buchanan, MacKay, and Director Wilson.

## INSTRUCTION STAFF

The instruction staff consists of members of the regular college faculty and special instructors selected for special fitness in the lines of work carried during the Summer Session. Heads of departments quite generally help out in the Summer Session work, so that the character of instruction throughout is fully up to the standard for the regular college year.

### Calendar, 1918

June 1, Saturday—Registration, 8 A. M. to 5 P. M.
June 3, Monday, 8 A. M.—Registration continued.
1 P. M.—Work begins on regular schedule.
June 8, Saturday—Regular work in A. M. (to make up work missed Monday A. M., June 3).
June 11, Tuesday, 8 A. M.—Opening of Rural Life Conference; continues through June 29, 4 P. M.
June 26, 27, 28, Wednesday, Thursday, and Friday—Examination for County Uniform Certificates.
July 12, Friday, 4 P. M.—Close of first half of Summer Session.
July 15, Monday, 8 A. M.—Beginning of second half of Summer Session.
July 17, 18, 19, Wednesday, Thursday, and Friday—Examination for County Uniform Certificates.
August 22, Thursday, 12 M.—Close of the Summer Session.

### General Information

**Conditions of Admission.** All students who can profit by the instruction offered will be admitted without examination. It is presumed that all applying for admission have a serious purpose, and are interested in the industrial work. College credit will be granted, however, only to those who meet standard entrance requirements.

**Fees.** The single summer session fee of $5.00 (for each six weeks) covers work in all courses with the exception of the Music Department. The fee for less than the full time is $1.00 a week or $1.00 per credit hour for the six weeks, with $2.00 as a minimum. Laboratory fees are indicated in connection with the descriptions of the studies. For the rural and grade teachers' work no registration fee is charged. No fee is charged for attendance at the rural life conference.

**General Statement.** Summer session work was offered by the Iowa State College for the first time in 1911. In that summer a short course extending over two weeks was attended by about fifty superintendents and high school teachers of the state. Since that time the interest in agriculture and industrial subjects has increased tremendously, not only in this state but throughout the United States. The Smith-Hughes bill for Vocational Education has been accepted by every state in the Union. In 1912 the Summer Session was extended to six weeks, and had a total enrollment of 128 students. The third Summer Session enrolled 225 students. These students came from sixty-three counties of the state and ten states of the union. In 1914 the summer enrollment reached 618. Students were present from 96 counties of the state, from 15 states besides Iowa, and from 7 foreign countries. A large proportion of them (80%) were teachers in the public schools. In 1915 the Summer Session enrollment was 790 during the first six weeks, and 264 during the second half. The 1916 and 1917 summer enrollments were little changed, except for an increased proportion of students doing regular college work. Teachers in service can be helped best through the Summer Session.

The courses offered have been found to meet the requirements of teachers and students, and will be continued in 1918 with very little change.

**Who May Properly Attend.** 1. *Teachers,* or persons expecting to teach next year, may use the Summer Session to secure work in the industrial subjects as required by recent legislation. Teachers in the elementary schools will find profitable work in agriculture, home economics, manual training, and pedagogy. High school teachers may find valuable preparation for the courses they teach, among the college credit studies.

2. *Superintendents, Principals, and Supervisors.* The large number of superintendents and principals who have been enrolled in the Summer Session in the past indicates clearly that it is serving them to good advantage. It gives them an opportunity to secure work of a high character under regular college instruction and under the most favorable conditions.

3. *County Superintendents* may profitably use the summer session to become better acquainted with the new industrial subjects.

4. *Club Leaders,* and others desiring knowledge of the industrial subjects for rural leadership or for teaching, will find work to fit their needs.

5. *High School Graduates* will find an opportunity to start the college course or to satisfy entrance requirements.

6. *Regular Students in the Iowa State College* may make up back

work, shorten their course by doing advanced work, or increase their electives.

7. *Students in Other Colleges* who are interested in the industrial work and related branches will find their own institutions willing to substitute credits made here.

8. *Graduates of the Iowa State College* may complete the necessary work in psychology and agricultural education in order to secure the first grade state certificate.

9. *Any Mature Person* who gives evidence of ability to carry the work with profit will be admitted without examination; such individual must satisfy the department concerned as to his ability to carry the work.

10. *Teachers* who desire work to qualify them under the Smith-Hughes Vocational Education bill will find studies that will meet their needs.

**Special Work.** Students wishing to do advanced or other special work not announced in this bulletin should communicate at an early date with the Director of the Summer Session, or with the professor in whose department they wish to work. Consideration may be given to a sufficient number of requests.

**Meeting Residence Requirements for a Degree Through Summer Session Work.** Because of the largely increased attendance at the Summer Session, provision has been made for the satisfying of residence requirements for a degree on the basis of four Summer Sessions of six weeks each. The amount of work required for the degree will need to be supplemented by work in absence, or by correspondence.

The Summer Session offers opportunity for graduate work in agriculture and related sciences. The number of graduate students in the Summer Session is increasing each year. Resident requirements for the master's degree may be met by attending the Summer Session for six weeks during three consecutive summers and carrying work in absentia. For a detailed statement as to graduate work, address R. A. Pearson, Acting Dean of the Graduate Division.

**Recreation.** While the primary object of the Summer Session is work and study, yet these will be facilitated by a sufficient amount of recreation. Students are urged to effect organizations and to arrange for tournaments in tennis, baseball, track, or indoor work. The Committee on Games and Recreation will encourage and help in organizing the details of this work. Play hour, 7 to 9 Friday evenings.

Recreation opportunities are supplemented by opportunities of hearing special lecturers of national reputation. A limited number of such speakers are invited this year to address the Summer School, among them the following:

1. Dr. David Snedden, formerly Commissioner of Education of Massachusetts, now of Teachers College, Columbia University. He will discuss current problems in vocational education.

2. Dr. Charles F. Fordyce, Dean of the College of Education, The University of Nebraska.

3. Superintendent M. G. Clark of Sioux City, Iowa.

Dr. Fordyce and Superintendent Clark will discuss phases of educational work of interest to teachers, superintendents, and principals. These and any other special lectures will have special bearing upon vocational education and the new problems due to the passage of the Smith-Hughes Bill.

Another feature which has been established as an annual affair is the appearance of the Elsie Herndon Kerns Company Players in an afternoon and an evening program.

**Tenting Privilege.** The privilege of tenting in the north woods will be continued. There is no charge for tenting space, but at present the space is limited. It will be well to arrange in advance for the privilege. Tents may be brought along or rented of tenting companies.

**Expenses.** Summer Session expenses will vary with the individual. For six weeks the expenses need not exceed $45 or $50, in addition to car fare. This makes provision for tuition, $5.00; room and board for six weeks, books and laundry, and other incidentals.

**Rural Life Conference.** The lectures in the rural life conference are free to summer session students as well as members of the conference. For special bulletin giving detailed program of the conference, write to Dean Chas. F. Curtiss, or to the Director of the Summer Session.

## College Credit Studies

A total of over eighty college credit studies is offered; thirty-six of these are in agriculture. An average student should be able to make six credits during either half of a summer session. All studies offered are completed during the summer session by increasing the number of recitations each week. A student desiring to carry more than six credits will be required to make application for permission to take extra work, application to be countersigned by all instructors involved.

The following college credit studies, descriptions of which may be found under the various departments, are offered for the summer of 1918:

| DEPARTMENT | NUMBER OF STUDY |
|---|---|
| Agricultural Economics | 110 |
| Agricultural Education | 1, 2, 3b, 5a, 7, 8, 10, 21a, 31a, 31b |
| Agricultural Engineering | 1, 5, 13, 19, 21, 30, 36 |
| Agricultural Journalism | 8, 9 |
| Animal Husbandry | 1, 2, 3, 4, 20 |
| Bacteriology | 1, 15, 18, 30 |
| Botany | 161, 470, 560 |
| Chemistry | 103, 104, 351, 352, 375, 376, 403, 801 |
| History | 6, 24, 98 |
| Home Economics | 1, 4, 6, 7, 21a, 37, 43, 44, 45, 46, 48, 49, 50, 51, 60, 61, 70 |
| Horticulture | 3, 38, 333 |
| Manual Training | M. E. 121, 140, 141, 181, 219, 220, 245, 331, 401 |
| Mathematics | 30, 40a, 40, 43, 45 |
| Physical Culture | S1, S2 |
| Physical Training | 5 |
| Physics | 205, 330. 404 |

## VOCATIONAL COURSES

Last summer special vocational courses were organized in Education, Agriculture, Home Economics, and Engineering because of the passage of the Smith-Hughes Bill. Such courses have since been organized into the regular work so that no special announcement of such courses is necessary this year. The entire work of the Summer Session centers around the preparation of teachers of vocational subjects.

## GENERAL COURSES

High school teachers are more and more interested in securing regular college credit work in agriculture, so that the general course for high school teachers is no longer continued. Superintendents and high school teachers can secure a combination of work in different departments which will enable them to secure a general view of the subject in a single summer if necessary. However, for rural and grade teachers, and for farmers, business men and homemakers, general courses are continued.

### General Agriculture

S-2. **Agriculture.** Each summer there have been a few farmers and business men and women desiring to get a general knowledge of the fundamentals of agriculture from the combined scientific and practical point of view. The demands of such individuals vary so much that it is necessary to take up each case and arrange a schedule accordingly. While one will desire to devote his full time to a study of farm animals, another will desire all of his time on the study of soils or plants or orcharding. It has been found possible to meet these demands quite fully and to give a combination of work which will enable each individual to get economically the practical information which he desires. Since those asking for this particular course do not ask for college credit, they are given considerable freedom, the sole purpose being to meet their demand in a satisfactory way. It is suggested that persons knowing in advance that they will ask for this course should write somewhat in detail the work which they desire. This will give an opportunity for consultation in arranging the course satisfactorily.

### Homemakers' Courses

The division of Home Economics will offer beginning and continuation courses of a very practical nature for homemakers of the state who may desire to take advantage of the summer work. This work has always been very popular because of its intensely practical nature and this

summer it has been decided to offer all courses coördinately, that is, without any prerequisite requirements.

Women who desire to come for the first three weeks of the Summer School can secure available units of work in the homemakers' courses and have at the same time an opportunity of attending the Rural Life Conference.

The SH courses correspond to those given in the regular Two-year Home Economics course and are open to the students enrolled in that department.

SH-1. **Food Study and Preparation.** Skill and efficiency in handling materials, utensils, stoves, fuels; systematic work in the kitchen. Fuels: origin, cleanliness, cost. Utensils: comparison of materials used and cost. Foods considered as to their source, manufacture, classification, composition, cost, and their function in the body. Practice cooking. (First three weeks.)

**Recitation 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.**

SH-2. **Handwork and Garment Making.** Fundamental sewing stitches on sewing apron; patching and darning; use and adjustment of sewing machine and its attachments. Altering commercial patterns to measurements. Two cooking laboratory aprons and underwear; advantages of chosen design. Emphasis on economical placing of pattern, method of making and finishing. Estimate of cost. Students provide materials subject to approval. (First three weeks.)

**Recitation 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.**

SH-5. **Food Study and Preparation.** The five food constituents; composition, manufacture, classification, digestion, economic and food value of foods; special foods; menus; table manners, table setting, meal serving, and care of the dining room. (Second three weeks.) Prerequisite SH-1.

**Recitations 2; labs. 2, 2 hr.; credit 3⅓; fee $3.00.**

SH-6. **Dressmaking.** Accurate measurement, preparation and use of dress form, comparison of drafted and commercial patterns. Planning, cutting, fitting and finishing of house dresses; a light weight wool dress and a lingerie dress. Study of choice of materials, suitable designs and cost. Care and repair of garments. Especially planned for women who wish to become more skilled in home sewing. (Second three weeks.)

**Recitations 1; labs. 2, 2 hr.; credit 2⅓; fee $1.00.**

S-33. **Millinery.** Designing and drafting patterns for hats, making and covering of buckram frames, covering of wire frames; making various types of trimming such as folds, pleating, cobochons, bows, and flowers; trimming and lining of hats. Renovation of materials and remodeling of old hats. The selection of hats based upon design principles and knowledge of materials used.

Prerequisite: A general knowledge of hand sewing.

**Recitation 1; labs. 2, 2 hr.; fee $3.00.**

S-34. **Design.** Principles of design, proportion, subordination, rhythm, balance; value of tones and theory of color. These fundamental principles are applied to abstract problems in lettering, spacing, etc., and furnish the basis for specific problems offered in the latter three weeks of the course. (First three weeks.)

Recitation 1; labs. 2, 2 hr.; fee $2.00.

S-35. **Design.** Study of perspective exemplified in simple sketches of still life, furniture and architecture. Application of principles of design and color harmony to concrete problems, including designs for fabrics, various useful articles, good in form, decorative posters, etc. (Second three weeks.)

Recitation 1; labs. 2, 2 hr.; fee $2.00.

## Rural and Grade Teachers' Work (Tuition Free)

(Students who are high school graduates may take college credit work upon payment of the fee).

This course is offered to enable rural and grade teachers to have the advantages of the unusual facilities of the Iowa State College in preparation for teaching agriculture, home economics, and manual training in the public schools in an intelligent and effective manner. The instruction will emphasize the elementary side of the subjects, giving particular attention to methods of preparing material, and of organizing the work in rural schools. The laboratories and teaching equipment of the college, including the library and the experiment farms, will be available to the students, but the aim throughout will be to handle the work so as to illustrate the possibilities of doing the work effectively under rural school conditions. The primary object of the course is to give work in the industrial subjects to present and prospective teachers, and other work will be offered only when carried along with industrial work.

**Admission to this work requires graduation from the common schools and the recommendation of the county superintendent of schools.**

The course makes provision for the following work:

1. **General Agriculture** S-3. This course is planned after consultation with the state department so as to meet the requirements of teachers who are preparing to teach agriculture in the rural and grade schools. The course will deal with the phases of agriculture that can be taught to the best advantage in the rural schools and will consist of class, laboratory, and demonstration work. Topics included in this beginning course of six weeks are soils and soil fertility, culture and improvement of crops, especially of corn, seed corn selection, storing, testing, and judging, weeds and weed eradication, bacteria, fungi and insects, orchards and orcharding, gardening for home and school, the propagation of plants, and related topics suitable for rural schools.

2. **General Agriculture** S-4. A continuation of S-3. Topics dealt with are farm animals, including horses, cattle, sheep and swine, but with

particular emphasis upon poultry. Poultry is considered by the state department and others as a topic particularly adapting itself for treatment in the rural and grade schools. The course will give the student a definite knowledge of the qualities to expect in good stock and will consider selection, improvement, care and management. Attention will also be given to dairying, including the use of the Babcock test.

3. **Home Economics S-32. Sewing.** This course includes the teaching of plain sewing upon articles which may be made in the one-room rural school. The emphasis will be upon plain sewing. Help will be given in the selection of materials, and the practical work of cutting, finishing, and repairing garments.

4. **Home Economics S-37. Cooking.** This course aims to teach the fundamental principles of foods and their preparation so that the rural school teacher will have a knowledge of the facts necessary for the teaching of cooking. Subjects treated include food preparation, food value to the body, and the planning and serving of economical meals. This work will be done in the regular college laboratories.

5. **Home Economics S-38.** This is the general course for rural and grade teachers. The work will be done under conditions and with equipment that can be easily duplicated in the rural schools. For part of the work a specially devised rural school home economics cabinet will be used. The emphasis will be placed upon the planning of a suitable course of lessons, demonstration with the pupils of the model school as a class, lesson planning, coöperation with the home, and necessary equipment. The purpose is to give the teacher a definite plan so that she will willingly carry out the work in her school next winter.

6. **General Manual Training S-6.** The introductory course of six weeks in general manual training will deal with the rougher and more practical farm problems and includes such exercises as work bench, saw horse, bench hook, nail box, corn tray, bird house, hog trough, milking stool, bench vise, seed sample case, chicken brooder, etc. Because of the bulky nature of the models in the exercises undertaken in this course, materials will be furnished without a fee, and at the close of the course students will be given the option of purchasing the models at actual cost of material.

7. **General Manual Training S-7.** This will be a continuation of general manual training S-6, but will deal more particularly with farm home problems. The exercises will require more refined work and a higher degree of finish and will include the necessary basis in drawings and reading of the same. Some of the exercises which will be undertaken are: book rack, plant stand, waste basket, medicine case, hall tree, porch swing, bulletin case, screen, small step ladder, sleeve board, fly trap, etc. The work will be accompanied by readings, lectures, and demonstrations. Double period daily.

8. **Manual Training** S-15. **Basketry and Weaving.** Lower grade work carried in connection with Didactics III. Not offered separately.

NOTE 1. Teachers will be interested in knowing of the ruling of the state educational board of examiners to the effect that grades in agriculture, home economics, and manual training when carried successfully for 12 weeks may be transferred direct to the certificate without further examination.

NOTE 2. Home economics students are requested to wear wash dresses in the cooking laboratories. White aprons, hand towels, and holders will also be required.

10. **Didactics.** The work in didactics for rural and grade teachers will consist of three courses as follows:

Didactics I.—A general course in didactics having in mind the preparation of the teacher for school work and for passing the examination. The course will deal with management, study, and the technique of the recitation.

Didactics II.—Special methods in arithmetic, geography, and language for the upper grades. Some attention to other subjects.

The recently adopted reading circle book, Wilson's Motivation of School Work, will be used as basic text for this course.

Didactics III.—Primary methods with particular attention to primary reading, busy work, and the special problems of the primary teacher. This course will be handled again during the coming summer by Miss Bertha Stiles, who has made it such a valuable course for lower grade teachers.

11. **Other Work.** Teachers of any grade who are enrolled in the Summer Session and are prepared to take college credit work may select subjects offered in the college credit list in so far as they are prepared to enter these classes. To secure college credit, the student must meet the usual preliminary requirements. It is customary here, as in other colleges and universities, to waive certain requisites in cases of mature students who obviously are prepared to take college grade work and for good reason have not complied with all the formal requirements.

The following list of college credit subjects will be of particular interest to rural and grade teachers. See descriptions under college credit courses.

Algebra 40a
History 24
Economics 110
Physics 330 or 205
English 10, 11
Public Speaking 3
Home Economics 50-51

Last year 75% of the rural and grade teachers were qualified to take college credit work. Accordingly the time schedule of the classes for the above work has been arranged to permit this work to be taken in connection with their other studies. In addition to the above, work in Music and in Physical Culture, including swimming, is open for rural and grade teachers.

**Fees in General Courses.** All of the work for rural and grade teachers will be entirely free to teachers and prospective teachers of Iowa. This will include not only the omission of the general tuition fee, but also of all laboratory fees.

**Teachers' Appointment Bureau.** A committee of the faculty, of which the director of the Summer Session is chairman, takes an interest in placing teachers in positions for which they are prepared. This committee in its work is able to serve the superintendents and school boards of the state as well as teachers interested in securing desirable promotion. The committee makes no charge for its services.

**The Model School.** The popular, two-room Model School will be continued, in charge of competent critic teachers. Regular work in observation and methods will be offered for students in the general courses, and the work of the model school will be used in the regular college courses in agricultural education. Students desiring extra opportunities for observation are asked to secure permission in advance.

## Legal Requirements

The recent legislation with reference to state-aided high schools, consolidation of schools, the teaching of agriculture, home economics, and manual training in the public schools, as well as the provisions relating to the twelve weeks and six weeks of professional training, have had much to do with the shaping of the courses for the summer session, and the work is so organized as to meet legal provisions. Agriculture, home economics, and manual training are the subjects in which the Iowa State College is, of all institutions in the state, best prepared to help teachers.

For information and special catalogue, write to *Director of the Summer Session, Iowa State College, Ames, Iowa.*

# Winter Short Courses

PRESIDENT, RAYMOND A. PEARSON

Dean C. F. Curtiss, Agriculture.
Dean S. W. Beyer, Engineering.
Dean Catherine J. MacKay, Home Economics.
Dean C. H. Stange, Veterinary Medicine.

The staff of instructors consists of the regular College faculty and lecturers of nation-wide reputation.

In 1919 the special winter short courses will be held during the week of January 27—February 1. Announcement of program and all details will be made through circulars and in reply to inquiries.

The special short course in agriculture, which originated in January, 1900, met with popular favor. Since then home economics and vocational work in engineering have been added. The work has proved to be of great practical value, and the attendance has extended far beyond the borders of the state and has reached nearly two thousand annually. A large amount of instruction is crowded into a brief period. Class work and laboratory work extend from 8:00 A. M. to 5:00 P. M. daily, and the evenings and portions of the day are devoted to convention programs consisting of lectures and general discussion of topics of interest to those in attendance.

The past year the following state associations held meetings at the College during the Winter Short Course:

Iowa Boys' and Girls' Club Leaders' Conference.
Iowa Swine Breeders' Association.
Iowa Society of Florists.
Iowa Corn and Small Grain Growers' Association.
Iowa Agricultural Experiment Association.
Iowa Nurserymen's Association.
Iowa Beef Producers' Association.
Iowa Holstein-Friesian Breeders' Association.
Iowa Aberdeen Angus Breeders' Association.
Iowa Short-horn Breeders' Association.
Iowa State Dairy Association—Dairy Cattle Section.
Iowa Women Farmers' Association.
Iowa Forestry and Conservation Association.
Iowa Cow-Testing Association.

It is expected that many more associations will hold meetings during the coming Short Course period.

These Winter Short Courses are an intensified system and a modern method of imparting instruction and inspiration to busy practical men and women whose lives are devoted to various pursuits. Many of the most prominent and successful men of the state and nation are annually attracted to these sessions.

An important feature of the Short Course is the patriotic and educational public addresses. In January, 1918, such addresses were given by U. S .Senator W. S. Kenyon, subject, "War at Close Range;" Dennis P. Hogan, president of Federal Land Bank, subject, "The Federal Land Bank Act;" Mrs. J. W. Watzek, president Iowa Federation of Women's Clubs, subject, "Women and the War;" President R. A. Pearson, assistant to the Secretary of Agriculture, subject, "The Farmer's Part in the War;" Lafayette Young, chairman State Council of Defense, subject, "National Defense;" E. A. Potter, member State Council of Defense; Mrs. Frances E. Whitley, chairman women's committee, State Council of Defense; J. F. Deems, State food administrator; Joseph E. Grew, former secretary of the American embassy in Germany; Hugh Gibson, former secretary of legation in Belgium.

## Special Work for Boys and Girls

Special classes will be arranged for juniors, boys and girls from ten to eighteen years of age. These will be in charge of instructors who are especially skillful in teaching boys and girls, and the work will be adapted to the needs of the young people.

The State Convention of the Iowa Boys' and Girls' Club occurs at this time, at which the annual business meeting is held and the other features of the convention are observed.

The premiums and trophies offered in judging team work in corn, livestock, and domestic science will be awarded at the close of the short course. The judging teams consist of three boys or three girls for each team organized. These teams may represent a local club, a school district, a county, or other organization. The work offered in the special junior classes is an aid in preparing the members of the team for the judging contests.

The Boys' and Girls' Club work is carried out through coöperative relations with the U. S. Department of Agriculture. The various projects are organized in either county or local units with definite county or local leadership. The work is developed, especially in counties employing county agents, through consolidated schools and county superintendents of public instruction. Some projects are developed through coöperation with state, county, and local organizations, such as the Beef Producers' Association, Poultry Associations, Boards of Education, Community and Commercial Clubs, and other organizations which

have a special interest in promoting the particular phase of work undertaken. The regular projects organized for 1918 are the following:

1. Acre Corn Club.
2. Baby Beef Club.
3. Pig Club.
4. Garden Club.
5. Tomato Club.
6. Canning Club.
7. Food Preparation Club.
8. Garment Making Club.
9. Handicraft Club.
10. Poultry Club.

## GENERAL PLAN OF COURSES

**Agriculture.** Animal husbandry; farm crops and soils; horticulture, with lectures on soils; veterinary medicine; botany; agricultural engineering; poultry husbandry; dairying; buttermaking; farm dairying; farm management.

**Engineering.** Vocational work; clay-working; uses of cement; road-making; drainage; power plants; steam and gas tractors; applications of electricity.

**Home Economics.** Practical lessons in household problems.

**Veterinary Medicine.** Course for practitioners.

## AGRICULTURE

### Animal Husbandry

**General Animal Husbandry.** This study will be devoted exclusively to score card practice, the judging of horses, cattle, both beef and dairy, sheep and hogs, and lectures on feeding them. Special attention will be given to the selection of animals best suited for feeding purposes. Good specimens of the highest type of fat steers and dairy cattle and ideal representatives of all the various breeds will be used for class work. At the conclusion of the cattle work, a slaughter test and block demonstration of the various market types of steers will be conducted under the supervision of Mr. John Gosling, of Kansas City, Missouri.

**Poultry Husbandry.** Some of the topics that will be discussed in the lectures are the importance of the poultry industry; selection of poultry farms; building poultry houses; feeding for egg and meat production; selection of breeding stock; incubation, brooding, raising chicks; caponizing, killing, dressing and marketing of poultry; diseases and parasites. Frequent use will be made of charts and lantern slides in this work. The practical exercises and laboratory work will include the study of poultry houses, incubators, brooders; the anatomy of the fowl and egg; selection of feeds; the killing and dressing of fowls; the selection of breeding stock; and the preparation of fowls for exhibition.

### Agricultural Engineering

Special courses are offered on gas engines and tractors, farm buildings, and agricultural drainage. One course of lectures is offered on the

general problems of the farm home, including a discussion of water supply, sewage disposal, heating and lighting problems, and the arrangement of buildings. (For detailed description of subjects see page 375 under Engineering).

## Botany

The laboratories of the Botany Department in Central Building will be open from 8 to 9 and 4 to 5 each day, for work in seed testing, identification and examination of weeds and weed seeds, or other special work that may be arranged with the head of the department. Special attention will be given to the identification of weeds common to Iowa farms, and to the provisions of the Iowa weed laws.

A special course of instruction will be arranged to meet the needs of seedsmen with reference to the requirements of the seed inspection law.

## Dairying

1. **Ten Day Course for Buttermakers and Creamery Managers.** Fee $5.00.

2. **Ten Day Course for Ice Cream Makers.** Fee $5.00.

3. **Ten Day Course for Operators of Market Milk Plants.** Fee $5.00.

Only experienced men will be admitted to work 1, 2, and 3. The work is so arranged that the students may divide their time between work offered in the three courses, or they may devote their entire time to one course only.

4. **Three Day Course for Cream Testers.** From January 27 to February 1.

In Course 4 the following work is offered:

Testing milk for butter fat; checking a series of milk tests against a composite of the lot; testing cream for butter fat; scoring of dairy barn; milk and cream testing; quality and grading of cream; and a study of Iowa dairy conditions and a review of the dairy laws.

## Farm Crops and Soils

**Farm Crops.** The important problems involved in the most successful production of our field crops will be discussed by men who have given special attention to their practical solution. These discussions have to do with the conditions found on the average Iowa farm. The corn, wheat, oat, and barley crops are considered, with attention to those special phases of seed selection, storage, testing, planting, cultivation, insect pests, etc., which will be of the most practical value.

In addition to the lectures and discussions, work will be offered daily in the laboratories in the judging and grading of the seed of the various grains.

Special attention is given such forage crops as alfalfa, red clover, sweet clover, and soy beans. Each of these crops will be discussed by specialists who can give the most accurate information.

Special meetings and conferences are arranged to discuss special problems which will meet the demands of men who have already attended one or more previous short courses.

**Soils.** A series of lectures and demonstrations dealing with soil management and fertility problems with special reference to Iowa soils will be given; also valuable facts and data regarding commercial fertilizers, green manures, barnyard manures, the use of leguminous crops and indirect fertilizers such as lime, methods of plowing, cultivating, and preparing the seed bed.

## Farm Management

**Farm Management.** The series of lectures on Farm Management will include the results of farm surveys from Iowa farms. Among the subjects discussed will be size of farm, types of farming, factors controlling profits in farming, and farm tenancy.

**Farm Accounts.** A simple practical method of keeping farm accounts will be presented in lectures, and personal help will be given any farmers desiring to begin such accounts. The value and interpretation of accounts will be emphasized.

## Forestry

**Woodlots.** Location, care, varieties of trees to be planted.

**Timber Plantations.** Culture of the catalpa, cottonwood, white pine, European larch, and other trees for posts, lumber, and fuel.

**Preservation of Farm Timbers.** Treatment of posts and timber with creosote and other preservatives.

**Windbreaks and Shelterbelts.** Cost, location, care, varieties, and the effects on growing crops.

## Horticulture

**Landscape Gardening.** Farmstead planning and planting; planning the home grounds; permanent plant materials for Iowa; civic improvement in Iowa in the city, town, and country.

**Fruit Growing.** Selection of varieties and management of orchards, vineyards, and small fruit plantations; planting, cultivation, pruning, grafting, spraying, harvesting, and marketing.

**Vegetable Growing.** Selection of varieties, preparation of land, cultivation, spraying, harvesting and storage of the leading vegetable crops in Iowa, with special attention to the potato. Marketing of vegetable crops; coöperative selling; general, local, and individual markets. Canning vegetables for market.

## Veterinary Lectures

A series of lectures will include talks on tuberculosis and other diseases of cattle and swine. The prevention, control, and eradication of the infectious and contagious diseases will receive special emphasis, including

the application of sanitary principles involved in each case. The new serum treatment for the prevention of hog cholera, and lameness and horseshoeing, including diseases of the foot, will be considered not only from a scientific standpoint, but also in such a way as to be understood by everybody. The conformation and soundness of the horse will be illustrated on the live animal. Those points which should be borne in mind in the breeding of farm animals will receive special attention. While it is impossible to give a course in veterinary medicine, the subjects of especial interest and immediate importance to the agriculturist will be considered as well as their practical application to farm conditions.

## ENGINEERING

The Short Courses in Engineering and general industrial work are held at various periods throughout the year so as to accommodate the interested industries. These courses are intended to supplement the work of trade and industrial organizations in the state.

These courses are of the convention nature and are strongly technical, being intended to emphasize the more important problems in the particular industries under consideration. The scope of this work includes the manufacture of cement products, manufacture of clay products, the production of concrete materials, the operation and care of sewage disposal plants, and similar lines related to the industries of Iowa, and the operation of municipal conveniences.

In addition to these specified lines of short course work, the Engineering Division coöperates in the program for General Short Course Week. At this time the Engineering Division offers general courses in the use of concrete, simple applications of electricity, farm lighting, private water supply and sewage disposal plants, farm drainage, public highways and similar problems related to every day rural life. For all this work the laboratories and equipment of the Engineering Division are available and, in addition to the staff of the Engineering Division, outside experts are secured for special lectures.

### General Courses

**Concrete Construction.** Outlined to meet the needs of bridge builders, manufacturers of concrete tile and concrete blocks, building contractors, fireproofers, silo builders, and contractors of general concrete construction.

**Automobile Operation and Care.** Lectures and demonstrations on the operation, adjustment, and care of the automobile. The new automobile laboratory and testing plant in the Transportation Building will be used for demonstration purposes.

**Applications of Electricity.** Work of an elementary nature dealing with the every-day applications of electric power such as house lighting from outside plants, farm lighting from private plants, common uses of power such as small motors for miscellaneous purposes, private telephones,

electric bells and alarms, automobile ignition, and similar common uses of this form of power.

**Gas Engines and Tractors.** Two separate courses are given in these subjects continuing throughout the short course period. The work is so arranged that one person may take the lectures and laboratory work in both subjects. This will require practically his entire time. The work in both courses is accompanied by special laboratory. The lecture and laboratory work is arranged with the idea of giving information on the selection of equipment for particular work, its care, operation, and repair necessary throughout the life of the machine.

**Farm Buildings.** The various farm buildings are discussed with special reference to the selection of material, proper design, and arrangement. Special attention is devoted to types of buildings developed by coöperation between the Experiment Station and farmers.

**Agricultural Drainage.** Agricultural Drainage is discussed from a theoretical and practical standpoint. Methods of procedure in organization, methods of construction, costs, and effects of drainage are discussed.

**Highway Work.** The annual road school for County Engineers is usually held at the college. The Highway Commission conducts this road school, but many of the lectures are of a general character and are open to those attending the short course. The college assists in this work. In addition special general lectures on road work are given.

### Special Industrial Courses

Since these courses are prepared in coöperation with various trade and industrial organizations, special bulletins announcing them will appear from time to time.

## HOME ECONOMICS

The course is designed for women who are interested in household problems and who are unable to avail themselves of a regular course in home economics. It meets the demand of Iowa women for instruction in feeding a family, food conservation, preservation of health, selecting ready-made clothing, home sewing, and community life. The course is changed each year to meet the needs of changing conditions.

## SPECIAL SHORT COURSES

### Country Newspapermen

A marked success has attended the short courses for country newspapermen which are now held annually at the college in the spring.

Their purpose met with immediate favor and the instruction aroused an interest that has made it desirable to continue these annual meetings. The program is not conducted as at many other editorial conferences and meetings, but is organized very much as a school of instruction. Work

is the rule and the two or three days devoted to the short course are filled from early until late with technical matters of country newspaper making. One of the large purposes of the short course is to link country newspapermen more closely with their rural constituencies and to suggest the opportunities for news and business that lie in strictly rural fields. Another large purpose of the program of instruction is to help solve some of the printing problems of the country newspaper establishment. The lecturers are drawn both from the regular college faculty and from the successful editors, publishers, and printers of the country field.

This short course is conducted by the Agricultural Journalism Department; therefore all correspondence concerning it should be addressed to that department.

### Practitioners in Veterinary Medicine

The Legislature has provided a special fund for courses of instruction for practitioners. During the summer a course of at least one week will be offered, and this will be supplemented by other work. It will include lectures and demonstrations covering some of the newest developments in the science of veterinary medicine. It is proposed to arrange the course so that practitioners may spend a few days at Ames and get the latest and best that is being made available in any state or country. At the same time, there will be a rapid review of some phases of veterinary medicine with reference to the needs of the practitioners. A special announcement of this course will be sent on application to the Dean of the Division of Veterinary Medicine.

# Extension

PRESIDENT RAYMOND A. PEARSON

The extension work of the Iowa State College is divided into two branches—agricultural extension and engineering extension.

**Agricultural Extension.** The agricultural extension work was established permanently by enactment of the Thirty-first General Assembly of Iowa. This act provided for giving lectures and demonstrations on the growing of crops and fruits, on stock raising, dairying, land drainage, and kindred subjects, including domestic science. Specific mention was made in this act of instruction in grain and stock judging at agricultural fairs, institutes, and clubs, and of aid in conducting short courses of instruction at suitable places throughout the state.

**Engineering Extension.** The Thirty-fifth General Assembly of Iowa provided an appropriation to establish a two-year vocational course at Ames, correspondence study in engineering, and extension work in as many of the industrial centers as the funds available would permit.

## AGRICULTURAL EXTENSION

DIRECTOR R. K. BLISS, B. S. A., Morrill Hall

SECRETARY A. A. SMITH, Morrill Hall

### Instruction Staff

L. G. Albaugh.....Asst. Farm Management Demonstrator
A. M. Avery.....Ext. Assoc. Prof. Farm Crops and Soils
Etta M. Bardwell, B. S.....Asst. State Club Leader
Nell M. Barnett, B. S. Household Arts Edu.....Ext. Asst. Prof. Home Economics
Rex Beresford, B. S. in A. H.....Ext. Prof. Animal Husbandry
R. W. Berry, B. S. in A. H.....Asst. State Club Leader
E. C. Bishop, B. Di., B. S., M. A.....State Club Leader
F. G. Churchill, B. S. in Agron...Ext. Assoc. Prof. Farm Crops and Soils
R. E. Coverdale, B. S. in A. H.....Ext. Asst. Prof. Animal Husbandry
Clara L. Cowgill, B. A.....Asst. State Leader Junior Work
R. K. Farrar, B. S.....Ext. Prof. Agricultural Education
*C. L. Fitch, M. A.....Ext. Assoc. Prof. Truck Gardening
L. G. Foster, M. A.....Field Agent in Marketing
Henry Hartman.....Ext. Asst. Prof. Pomology

* On leave of absence for Military Service.

M. A. Hauser.....Ext. Prof. Farm Crops and Soils
R. S. Herrick, B. S.....Ext. Prof. Pomology
M. H. Hoffman, M. Di., B. S. in A. E.....Ext. Prof. Agr'l Engineering
Mary Kelly, B. S. in H. E.....Ext. Asst. Home Econ. Junior Work
H. M. Lackie, B. S. A.....Ext. Prof. Poultry Husbandry
Wm. H. Lapp, B. S. A., M. S. A.....Ext. Asst. Prof. Poultry Husbandry
F. L. Odell.....Ext. Asst. Prof, Dairy Manufacture
*R. J. Pearse, B. S., M. L. A.....Ext. Asst. Prof. in Landscape Gardening
E. L. Quaife, B. S. in A. H.....Ext. Assoc. Prof. Animal Husbandry
L. S. Richardson.....Ext. Asst. Prof. Dairy Husbandry
Chas. Roach, B. S.....Visual Instruction
K. W. Stouder, D. V. M.....Ext. Prof. Veterinary Medicine
E. S. Shortess.....Field Organizer
P. C. Taff, B. S. in Agron.....Ext. Prof. Farm Crops and Soils
Assistant Director
S. H. Thompson, B. S. in Agron.....Farm Management Demonstrator

## Home Demonstration Work

Neale S. Knowles.....State Leader Home Demonstration Agents
Mrs. L. H. Campbell.....Asst. State Leader Home Demonstration Agents
Mabel C. Bently.....Asst. State Leader Home Demonstration Agents

### HOME DEMONSTRATION AGENTS

| NAME | COUNTY | ADDRESS |
|---|---|---|
| Clara Sutter | Black Hawk | Cedar Falls, Iowa |
| Julia Brekke | Clinton | Clinton, Iowa |
| Mariel Hopkins | Wapello | Ottumwa, Iowa |
| Mrs. Esther Kramer | Scott | Davenport, Iowa |
| Grace Richards | Wright | Clarion, Iowa |
| Mildred Wood | Webster | Fort Dodge, Iowa |
| Hermine Knapp | Palo Alto | Emmetsburg, Iowa |
| Mrs. Mary Gregg | Marshall | Marshalltown, Iowa |
| Ruby Gibbons | Clay | Spencer, Iowa |
| Helen Burling | Cerro Gordo | Mason City, Iowa |
| Pearl Greene | Des Moines | Burlington, Iowa |
| Elise Carlson | Sioux | Orange City, Iowa |
| Alice Thompson | Story | Nevada, Iowa |
| Mrs. Katherine Miller | Fayette | Fayette, Iowa |
| Mary B. Richardson | Calhoun | Rockwell City, Iowa |
| Florence Quilling | Hardin | Eldora, Iowa |

## City Home Demonstration Agents

| | | |
|---|---|---|
| Jessie Campbell | Polk | Des Moines, Iowa |
| Grace Conlon | Woodbury | Sioux City, Iowa |
| Glendolyn Warren | Linn | Cedar Rapids, Iowa |

* On leave of absence for Military Service.

## Home Demonstration Agents at Large

Until Located in Counties

Florence Watkins Janet Cation Dora Baldwin
Elva Aiken Vivian Jordan

## County Agent Work

J. W. Coverdale.....County Agent Leader
Murl McDonald.....Assistant County Agent Leader
J. E. Wooters.....Assistant County Agent Leader
Don E. Fish.....Asst. Emer. Demon. Agent Leader, Mt. Pleasant, Iowa
J. E. Neil.....Asst. Emer. Demonstration Agent Leader, Ames, Iowa
F. S. Finley.....Asst. Emer. Demonstration Agent Leader, Ames, Iowa
E. S. Dyas.....Asst. Emer. Demonstration Agent Leader, Ames, Iowa
C. M. Beem.....Farm Bureau Organizer, Charles City, Iowa
T. H. Isaacs.....Farm Bureau Organizer, Red Oak, Iowa
Grant Chapman.....Farm Bureau Organizer, Bagley, Iowa
John Sundberg.....Farm Bureau Organizer, Sioux City, Iowa
F. D. Steen.....Farm Bureau Organizer, West Liberty, Iowa
William Baker.....Farm Bureau Organizer, Mt. Pleasant, Iowa
W. B. Buck.....Farm Bureau Organizer, Mt. Ayr, Iowa
P. J. Miller.....Farm Bureau Organizer, Independence, Iowa
E. L. Scales.....Farm Bureau Organizer, Russell, Iowa
I. N. Taylor.....Farm Bureau Organizer, Oskaloosa, Iowa
C. E. Arney.....Farm Bureau Organizer, Albion, Iowa

### COUNTY AGENTS

| NAME | COUNTY | ADDRESS |
|---|---|---|
| Burge, Charles A. | Adair | Greenfield, Iowa |
| Wurstell, Vard | Adams | Corning, Iowa |
| Maughlin, Floyd | Allamakee | Waukon, Iowa |
| Munger, George | Appanoose | Centerville, Iowa |
| Wolfe, Paul | Audubon | Audubon, Iowa |
| Brant, W. O. | Benton | Vinton, Iowa |
| Burger, A. A. | Black Hawk | Cedar Falls, Iowa. |
| Beeler, O. W. | Boone | Boone, Iowa |
| Thorson, Theo. | Bremer | Tripoli, Iowa |
| Lee, R. T. | Buchanan | Independence, Iowa |
| Herren, W. | Buena Vista | Storm Lake, Iowa |
| Flint, V. W. | Butler | Allison, Iowa |
| Scott, C. C. | Calhoun | Rockwell City, Iowa |
| Coupe, J. F. | Carroll | Carroll, Iowa |
| Kelley, Henry P. | Cass | Griswold, Iowa |
| Carl, Leslie M. | Cedar | Tipton, Iowa |
| O'Donnell, R. F. | Cerro Gordo | Mason City, Iowa |
| Breakenridge, W. J. | Cherokee | Cherokee, Iowa |
| Mildenstein, E. J. | Chickasaw | New Hampton, Iowa |

| | | |
|---|---|---|
| Richie, R. W. | Clarke | Osceola, Iowa |
| Posey, W. A. | Clay | Spencer, Iowa |
| McNown, Mark F. | Clayton | Elkader, Iowa |
| Wise, L. O. | Clinton | De Witt, Iowa |
| Quist, J. S. | Crawford | Denison, Iowa |
| Pickard, C. L. | Dallas | Dallas Center, Iowa |
| Warner, V. G. | Davis | Bloomfield, Iowa |
| Woolley, Fred | Decatur | Leon, Iowa |
| Krall, J. A. | Delaware | Manchester, Iowa |
| Walker, Harley | Des Moines | Burlington, Iowa |
| Sawhill, W. H. | Dickinson | Spirit Lake, Iowa |
| Brame, Joe (Acting) | Dubuque | Dyersville, Iowa |
| Eldredge, John C. | Emmett | Estherville, Iowa |
| Combs, Clyde H. | Fayette | Fayette, Iowa |
| Dickinson, W. A. | Floyd | Charles City, Iowa |
| Thomas, J. F. | Franklin | Hampton, Iowa |
| Overley, Fred | Fremont | Sidney, Iowa |
| Davis, C. W. | Greene | Jefferson, Iowa |
| Macy, C. S. | Grundy | Grundy Center, Iowa |
| Wilson, D. G. | Guthrie | Guthrie Center, Iowa |
| Christensen, Chris | Hamilton | Webster City, Iowa |
| Nutty, L. T. | Hancock | Britt, Iowa |
| Walker, Ben H. | Hardin | Eldora, Iowa |
| Hammans, C. W. | Harrison | Logan, Iowa |
| Hazen, Glen | Henry | Mt. Pleasant, Iowa |
| Clark, R. L. | Howard | Cresco, Iowa |
| Noble, D. A. | Humboldt | Humboldt, Iowa |
| Fuchs, V. H. | Ida | Ida Grove, Iowa |
| Zentmire, D. H. | Iowa | Marengo, Iowa |
| McClellan, George | Jackson | Maquoketa, Iowa |
| Laflin, R. D. | Jasper | Newton, Iowa |
| Ferguson, H. C. | Jefferson | Fairfield, Iowa |
| Graff, E. F. | Johnson | Iowa City, Iowa |
| Clark, Fred F. | Jones | Wyoming, Iowa |
| Roessler, W. O. | Keokuk | Sigourney, Iowa |
| Wentworth, W. A. | Kossuth | Algona, Iowa |
| Clare, J. S. | Lee | Donnellson, Iowa |
| Miller, V. C. | Linn | Cedar Rapids, Iowa |
| Pickford, A. H. | Louisa | Wapello, Iowa |
| McCullough, H. F. | Lucas | Chariton, Iowa |
| Beckhoff, A. H. | Lyon | Rock Rapids, Iowa |
| Tucker, Fred R. | Madison | Winterset, Iowa |
| Wickham, Rex | Mahaska | Oskaloosa, Iowa |
| Miner, T. R. | Marion | Knoxville, Iowa |
| Buchanan, W. A. | Marshall | Marshalltown, Iowa |
| Farquhar, Fred | Mills | Malvern, Iowa |
| Tracy, F. E. | Mitchell | Osage, Iowa |

| | | |
|---|---|---|
| Shepard, Lester | Monona | Onawa, Iowa |
| Baxter, S. G. | Monroe | Albia, Iowa |
| Barker, Frank F. | Montgomery | Red Oak, Iowa |
| Merrill, J. W. | Muscatine | Muscatine, Iowa |
| Jackson, M. F. | O'Brien | Primghar, Iowa |
| Foster, J. R. | Osceola | Osceola, Iowa |
| France, Bert L. | Palo Alto | Emmetsburg, Iowa |
| Maakestad, W. T. | Pocahontas | Pocahontas, Iowa |
| Kennedy, Carl N. | Polk | Des Moines, Iowa |
| Felter, Victor | Pottawattamie, East | Oakland, Iowa |
| Allison, J. H. | Pottawattamie, West | Council Bluffs, Iowa |
| Eves, J. P. | Poweshiek | Malcolm, Iowa |
| Buck, W. B. | Ringgold | Mount Ayr, Iowa |
| Maharg, Earl | Sac | Sac City, Iowa |
| Bliss, G. R. | Scott | Davenport, Iowa |
| Thompson, A. C. | Shelby | Harlan, Iowa |
| Dunlop, George | Sioux | Orange City, Iowa |
| Espe, Knute | Story | Nevada, Iowa |
| Smith, Frank R. | Tama | Toledo, Iowa |
| Sewell, J. H. | Taylor | Bedford, Iowa |
| Stack, J. P. | Union | Creston, Iowa |
| Scott, Carl R. | Wapello | Ottumwa, Iowa |
| Sinnard, W. T. | Warren | Indianola, Iowa |
| Fedderson, M. H. | Washington | Washington, Iowa |
| McKelvy, Q. P. | Wayne | Corydon, Iowa |
| Richardson, H. R. | Webster | Fort Dodge, Iowa |
| Uban, J. L. | Winnebago | Thompson, Iowa |
| Watrud, H. O. | Winneshiek | Decorah, Iowa |
| Yockey, Rex | Woodbury | Sioux City, Iowa |
| Williams, H. P. | Worth | Northwood, Iowa |
| Torblaa, E. M. | Wright | Clarion, Iowa |

Additional help is required for special work such as short courses, demonstration farms, better seed campaigns, etc.

The work and usefulness of this department have made rapid growth. Through the farmers' institute work, short courses, county fair work, county agent work, and other activities, it reaches the farmers in every county of the state. It carries the results of the experiment station investigations to the people. Through its many avenues it annually reaches several hundred thousand people. Some of the activities of the department are shown as follows:

1. **Farmers' Institutes.** Institute speakers and demonstrators are supplied to each county organization wishing help in any of the various branches of agriculture, veterinary medicine, and homemaking.

2. **Short Courses.** The department is equipped to handle short courses in agriculture and homemaking of a week in duration; courses in agriculture and homemaking of three days' duration, special homemak-

ing courses; courses in dairying, fruit growing, truck gardening, and potato growing; veterinary schools for stock breeders; poultry and special courses for rural school teachers. These courses will be assigned to the localities requesting them.

3. **Live Stock, Corn, Small Grain, Domestic Science, Domestic Art, Poultry, Fruit, Vegetable, Dairy, and Truck Gardening Shows.** So far as possible competent judges and demonstrators will be furnished to county or other local organizations wishing help to conduct any of the above mentioned kinds of work. These judges will give reasons substantiating their awards, thus making shows of educational value.

4. **County Fair Work.** With the hope of making county and district fairs of more educational value to their respective localities, the department will furnish a limited number of judges of livestock, farm crops, vegetables, and pantry stores. These judges will give reasons for the awards made. Educational exhibits of the college and experiment station work will be made at a limited number of fairs.

5. **Picnics and Farmers' Meetings.** The department will furnish speakers on agricultural subjects for picnics, farmers' meetings, lecture courses, and other similar occasions.

6. **Agricultural and Homemaking Clubs.** The future development of Iowa is dependent very largely upon the prosperity and happiness of agricultural people. This being true, the department is prepared to aid in the organization of agricultural and homemaking clubs. These organizations will furnish both education and recreation for the people on the farm.

7. **Boys' and Girls' Club Work.** Through the Junior section of this department, thousands of boys and girls are now enrolled in study and contest work. Instruction covering almost every phase of agriculture and homemaking is offered.

8. **County Demonstration Work.** The department conducts demonstration experiments on a number of farms. At the end of the year the results of each county's work are published in bulletin form and distributed free to the people of the county.

9 **Cow Test Associations.** For several years the department has conducted cow test associations. These are usually organized in coöperation with local creameries. Accurate reports are kept of the amount of milk and butter fat and of the cost of production.

10. **County Organizations for Agricultural Agents.** Through the state leader of county work, forty counties have been organized and several more are in process of organization. The state leader will visit, so far as possible, counties wishing to organize for a county agricultural agent, and help perfect the organization for them. This is a new and very useful work and is conducted by the coöperation of three agencies: the county in which the agent is located, the United States Department of

Agriculture, and the Agricultural Extension Department of the Iowa State College.

11. **Animal Health and Hog Cholera Work.** The department furnishes expert veterinarians to deliver lectures on hog cholera, discussing the various forms of the disease and the symptoms indicating them; and to conduct demonstrations in the various parts of the state on the use of hog cholera serum. Farm sanitation and preventive measures for the control of animal diseases are also discussed.

12. **Aid to Public and High School Teachers in Agriculture and Home Economics.** The department will aid public and high school teachers to introduce agriculture, home economics, and manual training in the schools. This work is accomplished through correspondence courses, publications, institutes, and special short courses especially prepared for teachers.

13. **Farm Investigation Tours.** Each county has farmers who are especially successful in one or more of the various lines of agricultural production. The department conducts automobile tours in a number of counties each year to inspect these successful farms. This work is of distinct educational value.

14. **Special Demonstrations.** The department gives demonstrations in spraying, pruning, treating oats for smut, etc. These demonstrations are given in orchards, gardens, schoolhouses, and farm homes. This work reaches many people who do not come to the short courses and institutes.

15. **Correspondence Courses.** The department is now offering correspondence courses in agriculture to teachers. At present the following courses are given:

I. Farm Plant and Soils (90 lessons). Fee $2.50.
II. Home Economics (80 lessons). Fee $2.00.
III. Animal Husbandry (66 lessons). Fee $2.00.

The courses for teachers are both for the purpose of giving needed information and also of presenting desirable methods of teaching this subject in the rural and graded schools of Iowa.

16. **Materials for Schools.** Samples of soils representing the different soil types found in the state are furnished to schools. A limited number of samples of grains are also furnished. A small fee is charged for such materials.

17. **Improvement in Quality of Butter.** Advice is given concerning building and operating of creameries and the methods of handling, manufacturing, and marketing butter. Personal help is given to creamery patrons concerning methods of caring for milk and cream on the farm.

18. **Farm Management Demonstrations.** Farm management demonstrations will be made in certain selected areas for the purpose of determining the value of keeping accurate record of the different farm operations.

19. **Landscape Gardening.** Help is given in arranging grounds and buildings for rural homes. The object sought is to combine beauty and utility. Help is also given in arranging consolidated school grounds.

20. **Publications.** A large amount of printed material in the form of bulletins, circulars, pamphlets, etc., is distributed annually. The demand for information printed in concise form is growing rapidly.

Full particulars regarding any of the above lines of work can be had by addressing the Agricultural Extension Department, Iowa State College, Ames, Iowa.

## ENGINEERING EXTENSION

DIRECTOR KENNETH G. SMITH, Room No. 192, Chemistry Building
SECRETARY JAMES WILLIAM PARRY, B. S., Associate Professor

### INSTRUCTION STAFF *

Daniel C. Faber, E. E., Associate Professor....Technical Service Bureau
Allan B. Campbell, B. S. in E. E, Instructor.....Vocational Engineering
Charles S. Roach, B. S., Instructor.....Bureau of Visual Instruction
Harry S. Anderson.....Instructor
William R. Little, B. S. in M. E.....Instructor
Richard A. Leavell, B. S.....Lecturer for Automobile Institute
O. H. Johnson, B. S. in C. E.....Field Instructor
Edwin S. Shortess.....Field Organizer

As a department of the general extension work, engineering extension is coördinate with agricultural extension and bears the same relation to the Division of Engineering that agricultural extension does to the Division of Agriculture. The department has its own instructional force, who are, at the same time, members of the engineering faculty, coöperating closely with the division of engineering and the engineering experiment station. Statements concerning the field of work covered by the department follow:

(1). **Two-Year Vocational Courses at Ames.** These are practical courses intended to meet the needs of boys who have not had the benefit of high school training, and especially of practical men who desire to advance themselves in some particular branch. An eighth grade education is required for entrance. The applicant must also be at least seventeen years of age. Graduates of accredited high schools are not admitted. A large number of courses may be taken by correspondence, and thus the student is enabled to finish the two year course with approximately one year of residence work. Four courses are given in 1918-1919.

Two-year course for electrical workers and stationary engineers (page 337).

Two-year course for mechanical draftsmen and mechanicians (page 338).

* The Engineering Extension Staff consists of the President, Director, Professors, Associate Professors, Assistant Professors and Instructors doing engineering extension work.

Two-year course for structural draftsmen and building superintendents (page 339).

Special part time course for telephone men (page 340).

(2). **Correspondence Study Courses.** These are short practical courses of non-collegiate grade. Correspondence courses for entrance to college are also given. The practical courses coördinate closely with the vocational courses at Ames, and thus enable the student to complete these courses in less time in residence. All courses are especially prepared and given under experienced instructors. Among the subjects offered are shop mathematics, shop drawing and sketching, carpenters' and builders' drawing, builders' estimating, heat, heating and ventilation, plumbing, strength of materials, and the elements of structures.

The department is able to offer work in mathematics and other subjects for entrance and college credit by correspondence under certain conditions:

1. The qualifications of the student must meet the approval of the department concerned.
2. The work must be carried on under the direct supervision of the instructor.
3. An examination approved by the department must be given after completion of the course under a responsible representative of the college.
4. In the case of students desiring credit for entrance, or in the case of former students of this college, credit is granted when the student has satisfactorily completed the course and passed his examination.
5. In the case of students who have never entered this college but who desire to secure advance credit, credit obtained by correspondence under the above conditions shall not be officially granted until after one semester of satisfactory resident work.

The following subjects in mathematics are now available for entrance credit:

Algebra T7. Algebra to Simple Equations. Twenty Lessons. Price $10.00.*

Algebra T8. Algebra, Simple Equations through Simultaneous Quadratic Equations. Twenty lessons Price $10.00.*

Algebra T3. Algebra Review. Twenty Lessons. Price $10 00.*

Plane Geometry T5. Twenty lessons Price $10.00 *

Solid Geometry T16. Twenty lessons. Price $10.00.*

Plane Trigonometry T17. Twenty lessons. Price $10.00.*

The following subjects in mathematics are now available for college work:

Algebra Review. Intended for all students who feel the need of a thorough review in algebra Especially desirable for graduates of non-accredited high schools. College credit is not granted for this course. Ten lessons. Price $5.00.*

* NOTE: Twenty-five per cent rebate is allowed when the subject is completed and the examination is successfully passed.

College Algebra 40. Forty lessons. Price $20.00.*
Plane Trigonometry 41. Fourteen lessons. Price $7.00.*
Plane and Spherical Trigonometry 42 (a). Twelve lessons. Price $6.00.*
Plane Analytic Geometry 43. Thirty-two lessons. Price $16.00.*
Differential and Integral Calculus 44. Forty lessons. Price $20.00.*

(3). **Extension Classes in Industrial Centers.** These classes are formed when ten or more persons are interested in the same subject and meet not oftener than once a week under a special instructor. The courses offered are similar to those offered by correspondence and cover the same ground. The length of time required is from two to eight months, depending on the length of the course. These classes cover the subjects of shop mathematics, gas engines, heating and ventilation, mechanical drawing, carpenters' drawing, sheet metal pattern drawing, shop mechanics, and strength of materials.

(4). **Lectures and Visual Instruction.** The Department of Engineering Extension is prepared to furnish lectures on subjects related to the industrial and engineering interests of the state. In coöperation with Agricultural Extension, it maintains a Bureau of Visual Instruction through which lantern slides, motion picture films and charts on industrial and agricultural subjects may be obtained.

(5). **Courses for Night Schools and Industrial Schools.** In this work the department assists in the organization of classes in public night schools and industrial schools, by furnishing courses and supervising instruction. Lectures on industrial and technical subjects are also given during the course, supplementing the instruction. Schools desiring to furnish their own instructor may obtain courses for class use from the department.

(6). **Technical Institutes.** These are one-week courses consisting of lectures and exhibits held at different places covering engineering problems of general interest Courses for janitors and firemen, plumbers and steam-fitters, and warm air furnacemen are available and have been successfully given

(7). **Trade Courses.** These are given as short courses at Ames and elsewhere in which actual trade instruction is given by expert craftsmen. The time of the student is wholly occupied in the actual work of the trade under working conditions. He learns by doing and not by listening to lectures and demonstrations. In 1917 six ten-day courses for painters and decorators were held in six different cities, with an enrollment of 124 men, a three-day course for bakers, at Ames, and a three-day course for foremen of country newspaper plants. Schools for telephone operators and for telephone plant men have also been conducted. This work is to be expanded and developed into longer courses for beginners in the various trades as well as for journeymen. These trade courses coördinate closely with the correspondence and two-year work.

(8). **Bureau of Technical Service.** It is the purpose of the department so far as possible to render engineering assistance and to give general engineering advice. This will be done through coöperation with the engineering experiment station. Under their direction, tests will be conducted and reports made on plants, materials, or engineering appliances, the charge being sufficient to cover only the actual expense incurred. It is not the purpose of this department to invade the field of the consulting engineer, but rather to promote his practice by showing the advantages of expert advice and assistance.

(9). **Bulletins.** From time to time the department will issue bulletins on matters of general engineering interest such as the proceedings of conventions and special engineering courses. A number of bulletins have already been published. Technical bulletins are published by the engineering experiment station and may be obtained from them.

Full particulars in answer to questions concerning any of the branches of work mentioned above will be given, and literature explaining the methods of work mailed on application to the Department of Engineering Extension, Iowa State College, Ames, Iowa.

# Experiment Stations

## AGRICULTURAL EXPERIMENT STATION

### STATION STAFF *

Raymond A. Pearson, M. S. A., LL. D.....President
C. F. Curtiss, M. S. A., D. S.....Director
W. H. Stevenson, A. B., B. S. A.....Vice-Director

*Agricultural Engineering*

**M. F. P. Costelloe, B. S. in C. E., A. E.....Acting Chief in A. E.
W. A. Foster, B. Sci. in Edu., B. Arch.....Asst. in Agr'l Eng. Section
J. S. Glass, B. S. in A. E.....Asst. in Agr'l Eng. Section

*Agronomy*

W. H. Stevenson, A. B., B. S. A.....Chief
H. D. Hughes, B. S., M. S. A.....Chief in Farm Crops
P. E. Brown, B. S., A. M., Ph. D.....Chief in Soil Chemistry and Bact.
L. C. Burnett, B. S. A., M. S.....Chief in Cereal Breeding
L. W. Forman, B. S. A., M. S.....Chief in Field Experiments
John Buchanan, B. S. A.....Superintendent of Coöperative Experiments
R. S. Potter, A. B., M. S., Ph. D.....Assistant Chief in Soil Chemistry
R. S. Snyder, B. S.....Assistant in Soil Chemistry
H. W. Johnson, B. S., M. S.....Assistant in Soils
George E. Corson, B. S., M. S.....Assistant in Soil Survey
F. B. Howe, B. S., M. S.....Soil Survey
Knute Espe, B. S.....Soil Survey
T. H. Benton, B. S., M. S.....Soil Survey
H. W. Warner, B. S., M. S.....Soil Survey
L. L. Rhodes, B. S.....Soil Survey
M. E. Olson, B. S., M. S.....Field Experiments
P. M. Wolfe, B. S.....Field Experiments
J. F. Bisig, B. S.....Field Experiments
O. F. Jensen, B. S., M. S.....Assistant in Farm Crops

*Animal Husbandry*

W. H. Pew, B. S. A.....Chief
J. M. Evvard, M. S...Asst. Chief in An. Hus. and Chief in Swine Produc.
R. Dunn, B. S.....Assistant in Animal Husbandry

* The Agricultural Experiment Station Council consists of the President, the Director, and Chiefs and Assistant Chiefs engaged in agricultural experiment station work.
** Deceased January 12, 1918.

Orren Lloyd-Jones, M. S., Ph. D .... Assistant in Animal Husbandry
H. A. Bittenbender, B S A . . . ...Chief in Poultry Husbandry
L. S. Gillette, B S, M. S ..... ... ..Asst. Chief in Dairy Husbandry
A. C. McCandlish, M. S. A. ... .....Asst. in Dairy Husbandry
Rodney Miller, B. S. A..... .....Assistant in Poultry Husbandry

*Bacteriology*

R. E. Buchanan, M. S., Ph. D Chief; Assoc. in Dairy and Soil Bacteriol.

*Botany*

L. H. Pammel, B Agr, M S, Ph D... ..... .....Chief
Charlotte M. King.. . . ..... .... Assistant Chief in Botany
I E Melhus, B. S., Ph D... .... .. ... .....Chief in Plant Pathology

*Chemistry*

A. W. Dox, B. S. A., M, Ph D .. ... ..Chief (on leave of absence)
W. G. Gaessler, B S ..... ..... . ..... .....Acting Chief
A. R Lamb, B. S, M. S... ..... .... .....Assistant
S. B. Kuzirian, A B, A M, Ph. D.. ... . . .....Assistant
G. W. Roark, Jr., B. S..... .....Assistant

*Dairying*

M. Mortenson, B S A .. .. . . .. ... ..... ....Chief
B. W Hammer, B S A . ... . Chief in Dairy Bacteriology
D E. Bailey, M. S . Assistant Chief in Dairying

*Entomology*

R L Webster, A B .. .. .. ..... .... .Chief
E W. Atkins, B. S A . .. . . Assistant in Apiculture

*Farm Management*

H B Munger, B S .. ... ..... ... . ..... . .... Chief
O. G. Lloyd, B S., M. S . . . .. ..... .. .Assistant Chief

*Horticulture and Forestry*

S A. Beach, B S A, M S . .. ... ..... .. .. .....Chief
T. J. Maney, B. S ..... . ... . .....Chief in Pomology
Harvey L. Lantz, B. S.... .. .. ... .....Assistant in Fruit Breeding
**W. E. Whitehouse, B. S..... .....Assistant in Pomology
Harry E. Nichols, B. S ..... ... .. ..... .Assistant in Pomology
Andrew Edward Murneek, B A ..... Research Fellow in Pomology
..... ..... ..... . .. .. .Research Assistant Pomology
A. T. Erwin, M S ..... .. .... .. .....Chief in Truck Crops
Rudolph A. Rudnick, B S.. ... . . .Assistant in Truck Crops
G. B. MacDonald, B S. F., M F. .. .... .....Chief in Forestry
Frank H. Culley, B. S. A, M. L. A ..... .. Chief in Landscape Arch.

** On leave of absence.

*Rural Sociology*

G. H. Von Tungeln, Ph. B., M. A.....Chief

*Veterinary Medicine*

C. H. Stange, D. V. M.....Chief

*General Officers*

F. W. Beckman, Ph. B., Bulletin Editor F. E. Colburn, Photographer
C. E. Brashear, B. S. A., Assistant to Director

The investigations of the Experiment Station are intimately related to the College work of instruction, as the problems occupying the attention of the Station are those that have a material bearing on the profit of the farm, and they are also those that are timely and in need of accurate investigation. Whether relating to the field, the feed lot, or the laboratory, the aim is to investigate those questions which will have a practical relation to successful agriculture. Originality is made a feature of the work so far as is consistent with useful results. In all instances the sole object is to throw light on the truth relating to the various principles and practices of the farm.

Farm crops investigations support the instruction of the College in regard to varieties of grains and methods of cultivation, and thus enable the student to become acquainted with the latest ideas relating to them. Tests are made of different varieties of fodders, grasses, and grains, and of different cultural systems as related to crop production.

Farm management investigations are of peculiar value to students of the College. They afford a vast amount of statistical data regarding farm operations that are of the utmost value in a study of problems that underlie Iowa agriculture.

The experimental investigations with animals embrace a study of the value of different feeds for different features of animal production, the preparation of feeds, and systems of feeding; also a study of different types of animals suitable for the requirements of the market. The object sought in this department is to indicate the manner in which the Iowa farmer, through the employment of animals, can realize the most from his farm products and add to the fertility of the farm. The data from these experiments are always accessible to the student, who has the opportunity of observing daily the development of at least a portion of the investigations.

The work of the Experiment Station is in the closest touch with the dairy industry. The problems which practical men are constantly confronting and asking aid in solving are at all times objects of experimentation. The students not only see, but assist in carrying out these experiments. In this way they become acquainted not only with the problems to be solved, but with the methods employed in the investigations. This experimental work relates to the various problems of both butter- and cheese-making. The results of this work, together with those of the bacterial investigations, are daily used in class work.

The experimental work in horticulture also affords the student an opportunity to study the results of the theory of the class room as practiced in the field. The connection of the Department of Horticulture with the State Horticultural Society is such that problems touching the commercial side of fruit growing receive the closest attention. Experiments are conducted in spraying for the prevention of fungus pests and injurious insects; also in fertilizing, pruning, and thinning; in nursery work and in plant breeding.

The work of the Experiment Station has been extended by the addition of forestry investigations. Methods of practical treatment of fence posts and other timbers to increase durability are being determined in cooperation with the United States Forest Service and farmers and stockmen throughout the state. The adaptability of various trees for different sections of the state and methods of germination and storage are being tested. To get more definite data in reference to germination of seed and growth of seedlings in nursery rows, tree seed has been distributed to farmers in twenty-five counties of the state.

A 200-acre dairy farm is stocked and equipped for experimental and educational work. This farm and its equipment afford excellent facilities for experimental work in the farm production side of the dairy industry. A poultry department has also been added for experimental and instructional purposes.

An Agronomy experimental farm of 160 acres constitutes an important part of the Station equipment. This farm is used for field experiments in Farm Crops and Soils. The major part of the tract has been laid out in experimental plots. Forty acres are devoted to soils investigations, along the line of crop rotations and the use of phosphorus, commercial fertilizers, manures, green manures, lime, and other fertilizing materials in various cropping systems. The remainder of the farm is devoted to investigations with farm crops, with special reference to cereal breeding, alfalfa growing, and variety and cultural tests.

## ENGINEERING EXPERIMENT STATION

### STATION COUNCIL*

(Appointed by the State Board of Education)

Raymond A. Pearson, LL. D.....President
**Anson Marston, C. E.....Professor
Samuel Walker Beyer, B. S., Ph. D.....Professor
Louis Bevier Spinney, B. M. E.....Professor
Warren H. Meeker, M. E.....Professor
Fred Alan Fish, M. E. in E. E.....Professor

* The Engineering Experiment Station Council consists of the President; the Director; and the heads of the departments of Civil Engineering, Mechanical Engineering, Mining Engineering, Electrical Engineering, Agricultural Engineering, Architectural Engineering and Rural Structures, and Physics; and the Chief Engineer of the Iowa State Highway Commission.

** On leave of absence for Military Service.

***Martin Francis Paul Costelloe, B. S. in C. E., A. E.....Professor
Allen Holmes Kimball, M. S.....Professor
Thomas Harris MacDonald, B. C. E.....Chief Engineer, Iowa Highway Commission

ENGINEERING EXPERIMENT STATION STAFF

Raymond A. Pearson, LL. D.....President, Ex-Officio
**Anson Marston, C. E.....Director and Civil Engineer
Samuel Walker Beyer, Ph. D.....Acting Director, Mining Engineer and Geologist
Charles S. Nichols, C. E.....Assistant to the Director, Sanitary Engineer
Louis Bevier Spinney, B. M. E.....Illumining Engineer and Physicist
Warren H. Meeker, M. E.....Mechanical Engineer
Fred Alan Fish, M. E. in E. E.....Electrical Engineer
***Martin Francis Paul Costelloe, B. S. in C. E., A. E.....Agr'l Engineer
Homer F. Staley, B. A.....Ceramic Engineer
**T. R. Agg, C. E.....Highway Engineer
Allen Holmes Kimball, M. S.....Architectural Engineer
John Edwin Brindley, Ph. D.....Engineering Economist
**Max Levine, B. S.....Bacteriologist
D. C. Faber, E. E.....Industrial Engineer
Roy W. Crum, C. E.....Structural Engineer
Herbert W. Wagner, M. E.....Mechanical and Electrical Engineer
William J. Schlick, C. E.....Drainage Engineer
John S. Coye, S. B.....Chief Chemist
John S. Dodds, C. E.....Assistant Highway Engineer
B. Kamrass.....Assistant Engineer in Road Materials
R. C. Salter, M. S.....Research Fellow in Bacteriology
A. O. Smith.....Mechanician

The purpose of the Engineering Experiment Station is to afford a service through tests and analyses of materials, special investigation, evolution of new devices and methods, and expert advice:

For the manufacturing and engineering industries of Iowa;

For the industries related to agriculture, in the solution of their engineering problems;

For all people of the state in the solution of the engineering problems of urban and rural life.

It is doubtless true that Iowa will always remain in the front rank of the agricultural states of the nation, but it is also true that unless she develops as a manufacturing state she must drop behind in the race for supremacy. It is well known that the population of the State was practically stationary from 1900 to 1910; in fact Iowa was the only state in the Union which did not increase its population during that period. The fact is that with modern improvements in agricultural machinery one man now accomplishes much more on the farm than was formerly possible, and hence rural population the country over shows a strong tendency not to

*** Deceased January 12, 1918.
** Absent on leave for Military Service.

increase in density. If Iowa continues as a purely agricultural state, she must expect to drop behind the other states of the Union in their onward progress in population and wealth.

With our great deposits of coal, clays, and cement materials, and our other great industrial resources, including the greatest hydro-electric power plant in the world operating on our borders, there is no good reason why our agricultural implements should be manufactured in the main in other states, nor why our agricultural products should have to be forwarded to any material extent to other states for transformation into manufactured forms of consumption. Iowa should continue to develop its own manufacturing industries in immediate proximity to the sources of supply of raw material, or to the ultimate users of the products.

The development of manufacturing industries in Iowa must, in this modern day, depend largely upon scientific research and investigation, under Iowa conditions, in each industry. A great field for possible good is open here to the Engineering Experiment Station.

Of vital importance to the manufacturing industries of the State are the transportation interests. Although Iowa ranks twenty-fourth in size, yet her railway mileage is exceeded by only three other states in the Union. There are many technical problems in connection with transportation in Iowa which are proper subjects for study and investigation by the Engineering Experiment Station. The completion of the new Transportation Laboratory of Iowa State College offers new opportunities for research and experimentation along this important line.

In addition to its importance in connection with the manufacturing development of our State, the purpose of the Engineering Experiment Station is to serve the urban population of Iowa. The 1915 census shows that over 54 per cent of the entire population of the State live in cities and incorporated towns and villages. Our urban population has many important problems of life to solve. There must be developed, for example, proper methods of sewage disposal; streets must be graded; sidewalks and pavements must be designed and built; paving materials should be tested and the properties and merits thereof ascertained; pure and economical water supplies must be provided; electric light plants, heating and ventilating systems, power plants, telephone installations, and other engineering constructions must be furnished. In all these lines the work of the Engineering Experiment Station can be of utmost service.

In its Sanitary Engineering work the Engineering Experiment Station proceeds with the advice and direction of the State Board of Health, with which it actively cooperates.

It is also the purpose of the Engineering Experiment Station to solve the engineering problems of agricultural life and industries. It is fortunate for the State of Iowa that she has a strong engineering school associated with her agricultural school, and that both work together in utmost harmony and unity of purpose. The engineering problems of Iowa along agricultural lines must be of especial importance, owing to her preëminence in agriculture; and it is only by the united efforts of engineers and agri-

culturists that such problems can properly be solved. As an illustration may be mentioned the drainage engineering work, which is reclaiming a portion of the State of Iowa sufficiently large to exceed in area that of each of several individual states of the Union. There are also the problems of water supply, sewage disposal, and sanitation on the farm.

One of the most important engineering problems is that of roads. The State of Iowa, through an appropriation to the College for this specific purpose, has provided for road experimentation of the highest order. The establishment of the State Highway Commission as a State department by the 35th General Assembly, and the location of its headquarters at the College, make this line of investigation the more valuable on account of the coöperative arrangement thereby made possible. Through the Highway Commission the Engineering Experiment Station is kept informed of the real and urgent problems needing solution. Many lines of investigation are under way the solution of which should prove of great value to the highway work of the State.

In its Good Roads Experimentation work, the Engineering Experiment Station proceeds with the advice and direction of the Highway Commission, with which it actively coöperates.

## VETERINARY INVESTIGATION

Raymond A. Pearson, LL. D.....President
C. H. Stange, D. V. M.....Director
Chas. Murray, B S, D. V M.....Professor
L. E Willey, D. V. M.....Assoc. Professor
S. H McNutt, D. V. M.....Laboratory Assistant

The Veterinary Investigation Department is being supported by special appropriations made by the legislature, and laboratories and experimental animal rooms are equipped for this special work. There are but few animal diseases entirely understood, and many are understood in no particular. It is the object of this department to investigate such diseases with the view of working out some method by which they can be controlled or eradicated.

One feature of the work of this department is the diagnosis of disease by laboratory methods and examination of tissues. Veterinarians and live stock owners are encouraged to send to the laboratory tissues and materials from doubtful cases. Careful and painstaking examination of these is made, and animal inoculations are carried out for those cases which promise something new or rare. Reports of such examinations are submitted to the sender, and his cooperation is solicited in working out the cases. Accurate records of such work are kept on file in the laboratory and are available to members of the Veterinary Division at all times for their study and use. Thus the work of the department supports the instruction work and assists in keeping such instruction modern.

## STATE BIOLOGICAL LABORATORY

C. H. Stange, D. V. M.....Director
C. G. Cole, D. V. M.....Asst. Director
L. W. McElyea, D. V. M.....Inspector
P. B. Pontius.....Assistant to the Director

The State Biological Laboratory for the manufacture of hog cholera serum, toxines, vaccines, and biological products is maintained as a department in the Division of Veterinary Medicine. While hog cholera serum is the chief product, many other biological products and vaccines are produced in the Division, and the work is at all times available for study by the students of the college in general, and for those of the Veterinary Division in particular.

# School of Music

(Affiliated)

For Department of Music, see page 284

Archibold Bailey.....Associate Professor
Mary Schwartz.....Instructor in Piano

The purpose of the School of Music (affiliated) is to provide for the students, at low rates, proper instruction in vocal and instrumental music.

Students must register at Music Hall each semester before they begin their lessons. Each term is divided into quarters, and the students who register late for private lessons are obliged to begin on one of these quarters, charge to be made accordingly. All fees are payable at the Treasurer's Office before the registration is complete. Single lessons will be charged at the rate of $1.25.

### Tuition for Each Semester for Private Lessons

Half-hour lessons in Voice, Piano, Pipe-organ, or Violin:

| | |
|---|---|
| One a week | $20.00 |
| Two a week | 35.00 |
| Piano practise, one hour per day for the semester | 3.50 |
| Piano practise, two hours per day for the semester | 6.50 |
| Piano practise, three hours per day for the semester | 9.00 |
| Pipe-organ practise, one hour per day for the semester | 8.00 |

Additional hours at proportionate rates.

## MUSICAL ORGANIZATIONS

The following musical organizations are maintained by the College: a men's Glee Club, a girls' Glee Club, College Orchestra, College Military Band, College Concert Band, and a Festival Chorus. All of these societies give concerts during the year, and the Glee Clubs go on concert tours. The Advanced Choir gives special music at the chapel service on Sundays.

Eminent artists and musical organizations are brought to the College each year. Among those who have recently appeared are the Minneapolis Symphony Orchestra, the United States Marine Band, Maud Powell, Julia Culp, the New York Symphony Orchestra, David Bispham, Evan Williams, Louise Homer, Mischa Elman, Anna Case, Josef Hoffman, Mme. Schumann-Heink, Mme. Gadski, May Peterson, Casals, the Kneisel String Quartet, and the Zoellner String Quartet.

# General Information



## ADMINISTRATION

The laws of the United States and State of Iowa provide for the scope and the management of the State College of Agriculture and Mechanic Arts. It is under the State Board of Education, which consists of nine men nominated by the Governor and confirmed by the Senate. This Board appoints a finance committee consisting of three men who give their entire time to the management of the four state educational institutions of Iowa which the board is in charge of, under provision of the law and such rules and regulations as the State Board of Education may prescribe.

## GOVERNMENT

The character of the College buildings and the nature of the work make order, punctuality, and systematic effort indispensable. The institution, therefore, offers no inducement to the idler or the self-indulgent. All who are too independent to submit to needful authority, too reckless to accept wholesome restraint, or too careless to take advantage of their opportunities, are advised not to come. The discipline of the College is confined mainly to sending away those who prove, on fair trial, to be of this class. The final decision of all cases of discipline rests with the President of the College except when he delegates such power in particular cases to the deans or to some one of the standing committees of the faculty. A student senate has been organized to make recommendations to the President.

## HISTORY

An act establishing "A State Agricultural College and Model Farm" to be connected with the entire agricultural interests of the state was passed by the legislature of Iowa in 1858. This legislature also appointed a board of commissioners to buy a farm and erect a college building, and selected a board of trustees to secure a faculty and organize a college. In 1859 a farm of six hundred and forty acres situated near Ames was purchased.

In 1862 Congress enacted, and President Lincoln signed, a bill entitled, "An act donating public lands to the several States and Territories, which may provide colleges for the benefit of Agriculture and the Mechanic Arts."

Section 1 of this act provides that for the support of such colleges there be granted "an amount of public land, to be apportioned to each State in quantity equal to thirty thousand acres for each Senator and Representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860."

Section 4 requires: "That all moneys derived from the sale of land shall constitute a perpetual fund, the capital of which shall remain forever undiminished, and the interest of which shall inviolably be apportioned by each State which may take and claim the benefit of this act, to the endowment, support and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislature of the State may provide, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

The General Assembly of Iowa, September 11, 1862, accepted the grant upon the conditions and under the restrictions contained in the act of Congress, and by so doing entered into contract with the General Government to erect and keep in repair all buildings necessary for the use of the College. By action of the General Assembly the College was changed from an agricultural institution into a College of Agriculture and Mechanic Arts with the broad and liberal course of study outlined in the following paragraph. The College was formally opened on the seventeenth day of March, 1869.

In 1882 the General Assembly passed an act defining the course of study to be pursued as follows: "Section 1. That Section 1621 of the Code is hereby repealed and the following is enacted in lieu thereof: 'Section 1621. There shall be adopted and taught in the State Agricultural College, a broad, liberal and practical course of study, in which the leading branches of learning shall relate to agriculture and the mechanic arts, and which shall also embrace such other branches of learning as will most practically and liberally educate the agricultural and industrial classes in the several pursuits and professions of life, including military tactics,

Section 2. That all acts and parts of acts inconsistent with this act are hereby repealed.'"

August thirtieth the following act was approved by President Harrison: "Be it enacted by the Senate and House of Representatives of the United States in Congress assembled, that there shall be and hereby is, annually appropriated, out of any moneys in the treasury not otherwise appropriated, arising from the sales of public lands, to be paid, as hereinafter provided, to each State and Territory for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts now established, or which may hereafter be established, in accordance with an act of Congress approved July second, eighteen hundred and sixty-two, the sum of fifteen thousand dollars for the year ending June thirtieth, eighteen hundred and ninety, and an annual increase of the amount of such appropriation thereafter for ten years by an additional sum of one thousand dollars over the preceding year, and the annual amount to be paid thereafter to each State and Territory shall be twenty-five thousand dollars, to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic sciences, with especial reference to their application in the industries of life, and to facilities for such instruction."

The income of the College from national and state sources is therefore expended in instruction, experimentation, and illustration in agriculture and in the mechanic arts, and in the underlying and related sciences and literature. All buildings are erected and all repairs thereon are made by the State of Iowa.

The college property is valued at $3,973,570.67.

## LOCATION

The College occupies a delightful and healthful location upon high, rolling land in the west part of Ames, Story County. Situated at the junction of the north and south branch and the main double-track line of the Chicago & Northwestern Railroad, and connected with all the trunk lines of Iowa, Ames is easily accessible from all parts of the state. An electric railway connects Ames and the College. The Fort Dodge, Des Moines and Southern Railway (electric), with stations on the campus, gives efficient service to the College and connections with the following trunk lines: At Fort Dodge, with the Illinois Central and Chicago Great Western; at Huxley, with the Chicago, Milwaukee & St. Paul; at Des Moines with the Chicago, Rock Island & Pacific, the Chicago Great Western, and the Chicago, Burlington & Quincy.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising, and cordial. The town has an excellent system of public schools, numerous churches, waterworks, and electric lights, and it also has a good city government. It is an inviting community for families who wish to educate their children and enjoy a

good environment at a reasonable expense. Ames and the College are on very cordial terms, and its citizens seek to promote the efforts of the students and the highest interests of the College.

## GROUNDS

Of the entire College domain of 1,355 acres, 125 acres are set apart for College grounds. These include the experimental plots, the young forestry plantations, the surroundings of professors' dwellings, and the central campus with its beautiful walks and drives, its trees, shrubbery, and flower gardens, and its large and stately buildings. The true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make the entire campus a large and beautiful park.

## BUILDINGS

Fifty commodious buildings besides the dwelling houses and the buildings for farm stock, machinery, and work, have been erected by the State for the exclusive use of the various departments of the College. All of these buildings are heated by steam, lighted by electricity, and supplied with pure water.

**Agricultural Engineering Hall.** This is a four-story building, above the basement. The basement and first story are of stone, and the upper stories of brick. It contains offices, recitation rooms, reading room, gas engine and cement laboratories, the carpenter shop of the Department of Agricultural Engineering, and offices, recitation rooms, and laboratories for the two-year work in Agronomy, Botany, and Horticulture.

**Agricultural Engineering Annex.** This is a four-story fireproof building of pressed brick and reinforced concrete construction, costing when equipped about $70,000. It accommodates the forge and repair shops, farm machinery and tractor laboratories, class room, and rooms for the exhibition and study of farm machinery. Office, drawing, and experimental rooms for work of the Agricultural Engineering Section of the Agricultural Station are located in this building.

**Agricultural Engineering Garage.** This is one story clay block structure. It has six sections which are used for college repair and farrier shop, tractors, and other equipment of the Department of Agricultural Engineering; and for freight department trucks.

**Agricultural Hall.** Agricultural Hall is 234 by 78 feet in size, and four stories in height. It is fireproof throughout, of the best modern construction, and arranged with suitable conveniences and facilities for thoroughly efficient high-grade work in agricultural instruction and investigation. This building, with its equipment complete, cost about $350,000.

**Agricultural Hall Annex.** This contains the assembly room and lab-

Section 2. That all acts and parts of acts inconsistent with this act are hereby repealed.'"

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The college property is valued at $3,973,570.67.

## LOCATION

The College occupies a delightful and healthful location upon high, rolling land in the west part of Ames, Story County. Situated at the junction of the north and south branch and the main double-track line of the Chicago & Northwestern Railroad, and connected with all the trunk lines of Iowa, Ames is easily accessible from all parts of the state. An electric railway connects Ames and the College. The Fort Dodge, Des Moines and Southern Railway (electric), with stations on the campus, gives efficient service to the College and connections with the following trunk lines: At Fort Dodge, with the Illinois Central and Chicago Great Western; at Huxley, with the Chicago, Milwaukee & St. Paul; at Des Moines with the Chicago, Rock Island & Pacific, the Chicago Great Western, and the Chicago, Burlington & Quincy.

Ames is a most desirable town for wholesome college influences. Its people are thrifty, enterprising, and cordial. The town has an excellent system of public schools, numerous churches, waterworks, and electric lights, and it also has a good city government. It is an inviting community for families who wish to educate their children and enjoy a

good environment at a reasonable expense. Ames and the College are on very cordial terms, and its citizens seek to promote the efforts of the students and the highest interests of the College.

## GROUNDS

Of the entire College domain of 1,355 acres, 125 acres are set apart for College grounds. These include the experimental plots, the young forestry plantations, the surroundings of professors' dwellings, and the central campus with its beautiful walks and drives, its trees, shrubbery, and flower gardens, and its large and stately buildings. The true principles of landscape gardening have been so faithfully observed in the gardening and in the location of buildings and drives as to make the entire campus a large and beautiful park.

## BUILDINGS

Fifty commodious buildings besides the dwelling houses and the buildings for farm stock, machinery, and work, have been erected by the State for the exclusive use of the various departments of the College. All of these buildings are heated by steam, lighted by electricity, and supplied with pure water.

**Agricultural Engineering Hall.** This is a four-story building, above the basement. The basement and first story are of stone, and the upper stories of brick. It contains offices, recitation rooms, reading room, gas engine and cement laboratories, the carpenter shop of the Department of Agricultural Engineering, and offices, recitation rooms, and laboratories for the two-year work in Agronomy, Botany, and Horticulture.

**Agricultural Engineering Annex.** This is a four-story fireproof building of pressed brick and reinforced concrete construction, costing when equipped about $70,000. It accommodates the forge and repair shops, farm machinery and tractor laboratories, class room, and rooms for the exhibition and study of farm machinery. Office, drawing, and experimental rooms for work of the Agricultural Engineering Section of the Agricultural Station are located in this building.

**Agricultural Engineering Garage.** This is one story clay block structure. It has six sections which are used for college repair and farrier shop, tractors, and other equipment of the Department of Agricultural Engineering; and for freight department trucks.

**Agricultural Hall.** Agricultural Hall is 234 by 78 feet in size, and four stories in height. It is fireproof throughout, of the best modern construction, and arranged with suitable conveniences and facilities for thoroughly efficient high-grade work in agricultural instruction and investigation. This building, with its equipment complete, cost about $350,000.

**Agricultural Hall Annex.** This contains the assembly room and lab-

oratories, all semi-circular in form, the base being ninety-six feet in diameter. The annex is fireproof throughout and of the best modern construction.

**Agronomy Farm Buildings.** The following buildings are located on the Agronomy Farm:

1. A two-story frame dwelling house.
2. A two-story frame seed house.
3. A horse barn, adequate in size to accommodate eight work horses and two cows.
4. A combined hay and machinery storage barn.

These are all old buildings, except the seed house, which was built two years ago at a cost of about $1400. The two barns were remodeled to some extent two years ago at the cost of $1000.

**Alumni Hall.** This is a brick building 87 by 48 feet, colonial style. It has three stories and a basement. In the basement there is a cafeteria. On the first floor there are reception rooms, reading rooms, and offices of the Young Men's and Young Women's Christian Associations. On the second floor there are an assembly room, Bible class and committee rooms, social rooms, and the office of the Alumni Bureau. The third floor is used for dormitory purposes. This building was provided for the Young Men's Christian Association by private subscription.

**Animal Husbandry Laboratory.** This new building, built of brick, 74 feet by 112 feet, is fully equipped for the killing of cattle, sheep, and hogs, for the handling of carcasses, cuts, and by-products, and for the curing of meats. The building is divided into three main parts. The first part includes the killing floor, refrigerators, and cutting room; the second part, through the middle portion of the building, is a pavilion into which may be taken the live animals which are to be slaughtered; the third, an amphitheater seating 500 people, is provided for use during short courses and special demonstrations

**Biological Laboratory.** This building, 116 by 32 feet in size, with two wings measuring 48 by 128 feet, is occupied by the State Biological Laboratory. It has room for 750 head of serum producing animals, and will soon be enlarged to accommodate many more.

**Bleachers.** Concrete bleachers on State Field were completed in 1915. The bleachers are 360 feet long, 28 rows high, and constructed of reinforced concrete with wood seat boards. Total capacity is 5625. It is possible to see perfectly from every seat the football field and the entire running track including the 220 straight-away.

**Book Store and Post-office.** This is a small one-story brick building which contains the College book store and the branch government post-office known as Station A.

**The Campanile** is a detached tower 110 feet in height, built of buff brick with terra cotta trimmings. This tower stands practically in the center of the campus. It contains a Seth Thomas tower clock with four

dials, each seven feet in diameter. The tower also contains the Margaret Chimes presented to Iowa State College by Dr. Edgar Williams Stanton in memory of his wife, Margaret McDonald-Stanton. The chime was manufactured by John Taylor & Company, Loughborough, England. It has ten bells, the combined weight of which is 15,000 pounds.

**Central Building.** The New Central building, which has been erected on the site of the old Main building, accommodates the executive offices, the general library, and the departments of English, modern language, economic science, history, mathematics, public speaking, and botany. The building is of buff Bedford stone, built in the Roman Renaissance style, a style that is also used for the Engineering and new Agricultural halls. The building completed and furnished cost about $375,000.

**Central Heating Plant.** A central heating and power plant furnishes heat and power for all College purposes with very satisfactory results in comfort, economy, and cleanliness.

**Ceramics Building.** The Legislature provided an appropriation of $15,000 for the construction of a new Ceramics building, which was completed in the fall of 1909. It is a three-story, fire-proof building, 70 by 50 feet in size, containing clay working rooms, kiln rooms, and other adequate accommodations for Ceramics work. On the second floor are offices and recitation rooms, and on the third floor a laboratory devoted to work of the Physics Department.

**Chemistry Building.** Chemistry Building is located north of Central Building and just north and across the tracks from Central Station. It is the largest building on the campus and one of the largest chemistry buildings in the country. It is a three-story brick structure with a usable basement, having a length of 244 feet and a width of 162 feet. There are four wings, each 57 by 76 feet, accommodating the large laboratories and class rooms. The wings are connected by a central part 92 by 162 feet, in which are located the main offices, the storeroom system, many small laboratories and research rooms, and the auditorium with a seating capacity of 300. There are three courts, one on the east and one on the west between the wings, and one at the center of the building over the auditorium, making it possible to light the building in a most satisfactory way. The plans also provide for an extension to the north as the future may demand without destroying the symmetry of the building or the general working plan of the interior. The main ventilating system, similar to the usual installation in large buildings, is supplemented by a unit system under fan control. Each large laboratory and units of smaller laboratories have independent ventilating systems. This provides all the hoods with forced ventilation and does away with fumes and disagreeable odors in a marked degree.

The arrangement of well-equipped laboratories, research rooms, and offices is such that each floor is devoted to certain general classes of work. Inorganic chemistry and qualitative analysis are located on the third floor. This work occupies the two large laboratories to the north. The Chem-

istry sections of the Agricultural and Engineering Experiment Stations occupy the laboratories to the south. Agricultural chemistry, household chemistry, applied organic chemistry, organic analysis including food and sanitary chemistry are located on the second floor. Inorganic analysis, physical and electrochemistry, and physiological chemistry are located on the first floor. The chemical engineering chemistry laboratories are located in the basement, where they occupy the entire west portion. The two-year work in chemistry for agricultural, home economics, and trade school students occupies the entire east portion.

The class rooms are located in the front of the building, in order that students may consume as little time as possible in going from one department to another. The large laboratories where the majority of the students work are located as near as possible to the storeroom supply system. They are also arranged to accommodate the maximum number of students most conveniently.

Research rooms have been planned for all divisions in applied chemistry.

**Civil Engineering Laboratory.** This is a three-story stone and brick building, which has been entirely remodeled and rebuilt into a modern laboratory building, fireproof except for the roof. The Hydraulic laboratory occupies a basement wing lined with enameled brick, and also the floor above it. There are two large structural laboratory rooms, one road materials laboratory, one large cement laboratory room, four computing and research rooms, five instrument rooms, and offices. The Engineering Experiment Station structural and cement testing laboratories are located in this building.

**Dairy Barns.** These include a modern cow barn with feed storage at the end of the stable, calf and maternity barn, and the old barn used for housing young stock and for judging purposes. The main building accommodates sixty-four cows, is permanently constructed, has two large block silos in connection and provides for ample feed storage. The calf and maternity barn is of warmer construction, having storage overhead. It also contains ten especially designed stalls for experimental work and laboratory for the Dairy Husbandry Section. These new structures in connection with the old barn permit the handling of a dairy herd of sufficient size to afford students excellent representatives of the various dairy breeds for use in judging work.

**Dairy Building.** This is a three-story structure built of pressed brick and trimmed with Bedford stone, containing butter, cheese, ice cream and market milk laboratories, refrigerators, offices, research laboratories, farm dairy room, students' testing laboratory, lecture rooms, dairy reading room, and bacteriological laboratories.

**Dwelling Houses.** There are on the campus eighteen comfortable dwelling houses occupied by professors' families, or by foremen and employees.

**East Hall,** the second of the new dormitories for women, was completed last year. It is located near West Hall and is similar in size and construction.

**East Hall Annex.** This annex is near East Hall and accommodates 20 young women. The building is very pleasant and homelike and is provided with steam heat, electric lights, baths, and parlor. The young women living in this building board at East Hall.

**Engineering Annex.** This is a two-story fireproof building, 50 by 208 feet, completed in the fall of 1909. Its total cost was $41,000. There has recently been completed an addition 21½ by 43 feet in which is housed the substation for the electrical engineering laboratory. The first story is devoted to the use of the departments of electrical engineering, mining engineering, and surveying. In it are located the dynamo engineering laboratory, assaying and clay working rooms, an instrument room and class room. The second story contains the offices of the electrical engineering department and drafting rooms and class rooms for the electrical, civil, and mechanical engineering departments; also the designing department of the Iowa State Highway Commission, which is not a part of the College. The third story contains laboratories for the Physics Department, and a blue-print room for the Iowa Highway Commission.

**Engineering Hall.** This is a fireproof building in which all the engineering departments, except agricultural engineering and electrical engineering, have offices, recitation and lecture rooms, laboratories, engineering museum, and the engineering laboratory. The Iowa State Highway Commission, located by law at the College, though not a part thereof, occupies offices on the first floor at the north end of this building. It is of Bedford stone, has plate glass windows, and modern conveniences and furnishings throughout. This building, costing $220,000, is one of the best engineering buildings in the United States.

**Forge Shop.** This is a one-story brick building, main part 38 feet by 78 feet with attached stock room 16 feet square. The roof is of steel and slate construction. Coal bunkers having combined capacity of 40 tons are located at each end of the forge room. Vitrified tile and concrete ducts placed underneath the floor carry the air for the forges and remove the smoke and waste gases. The building is steam-heated and the exhaust fan and high roof construction insure satisfactory ventilation.

**Foundry.** This is a one-story brick building 38 feet by 78 feet, with roof of steel and slate construction. The steel roof trusses support a traveling crane. The building is steam-heated, and good natural ventilation is secured through the high roof construction. Sheds and an ample yard at the rear provide storage space for foundry supplies.

**Greenhouses.** The new greenhouses, completed in 1915, comprise twenty-two thousand square feet under glass and are of the most approved type of iron construction. They comprise fourteen houses, and provide excellent facilities for instructional work in plant propagation, commercial floriculture, vegetable forcing, plant breeding, and research work.

The old greenhouse plant contains 11,040 square feet under glass. The houses are of cypress construction, supported by a steel structure. They are heated by steam. The houses also include four work-rooms used in potting, transplanting, and other necessary work.

**Gymnasium.** This building, 297 feet long and 83 feet wide, is one of the largest in America devoted to physical training. Each of its two great exercise rooms has an area of nearly one-third of an acre. One has a dirt floor for indoor practice in all outdoor sports. The other, in the second story, has space for basket ball courts, volley ball, baseball cage, indoor baseball diamond, complete gymnasium apparatus, and a 1-12 mile track. In the wings are lockers and special exercise rooms, baths, a pool, handball courts, and athletic quarters. This building cost $165,000.

**Home Economics Building** was erected at a cost of $75,000. The building is of red compressed brick and of fireproof structure. The heating is both direct and indirect radiation; the entire amount of air in the building is changed every few minutes, thus providing perfect ventilation. The entire building is furnished and equipped from the standpoint of utility, simplicity, and beauty.

**Horse Barn.** The barn, built of brick, with a slate roof, is for horses, for the storage of grain, and for general farm purposes.

**Horticultural Laboratory.** This is a two-story wood building connected with the old greenhouse. The main floor, accommodating fifty students, is especially fitted for the study of fruits. The building is equipped with two refrigerators, one for experimental work in cold storage and the other for storing fruits for class purposes.

**Judging Pavilion No. 1.** This building of brick is circular in form and is well heated and lighted. It accommodates several hundred students at a time, and affords facilities for stock judging and animal husbandry.

**Judging Pavilion No. 2.** In connection with the experimental barn, there is a two-story octagonal judging pavilion. It is built of buff pressed brick with a slate roof. The lower story is used for stock judging, and the upper for grain judging.

**Judging Pavilion No. 3.** This new judging pavilion is, in type and style, the same as the pavilion described above.

**Lake LaVerne.** Through the generosity of Dr. LaVerne W. Noyes '72, of Chicago, a lake, named in his honor "Lake LaVerne," has been constructed in the valley of College Creek on the south side of the campus. This lake with an area of about three and one-half acres contributes to the landscape features of the campus and provides excellent skating.

**Machine Shop.** This is a brick building 45 feet by 150 feet, of the main floor and gallery type construction. Two rows of steel columns which partially support the roof and balcony floor are also designed to carry a traveling crane and main lines of shafting. Locker room, class rooms, and office are located at the front end of the main floor. The building has a hot blast system of heating and ventilating, the air receiving its

heat from an indirect steam coil located on the balcony floor. A tool room and supply room above are located at the middle near one side of the building.

**Margaret Hall.** This building, one of the homes of the young women of the College, occupies one of the most pleasing locations on the campus. It is of brick, roofed with slate, provided with steam heat, electric lights, baths, and a large parlor. The hall accommodates about one hundred women, to whom the rooms are assigned in the order of their application. In connection with the Hall there is a boarding club for young women, where all living in the building are required to board

**Margaret Hall Annex.** This dormitory is located west of the central campus. It is a very attractive home for the young women. The building accommodates 21 women, and is provided with furnace heat, electric lights, baths, and parlor. The young women living in this building board at Margaret Hall.

**Morrill Hall.** Morrill Hall, one of the oldest of the College buildings, was named in honor of Hon Justin S. Morrill, the originator of the "Land Grant" for colleges of agriculture and mechanic arts. It is of deep red brick with stone, brick, and terra cotta trimmings In it are the College chapel, zoological museum, botany lecture rooms and laboratories, and the offices of the Agricultural Extension Department and the bulletin shipping rooms

**Music Hall.** This is a two-story frame building, fitted with apparatus and instruments for practice and instruction.

**New Dormitory No. 3** will be ready for use in September, 1918. It is the third dormitory for women to be constructed on the new site selected for a group of buildings devoted to the interests of women of the college. The plan of this dormitory is different from that of the first two constructed in that it provides for only sixty-two students in two equal groups. The building is so constructed that one group has one half of the building and the second group the other half. Separate dining rooms with a common kitchen are provided. The parlors are in common, however, and one matron looks after both groups.

**New Hospital.** Construction work on the new hospital building is well under way and it will be ready for use at the opening of the fall semester, 1918. The new and old buildings will be operated together, and in this way the hospital facilities available will be greatly increased. The new building will be fireproof throughout and on a par with modern hospital construction. It will have three floors. On the first floor will be consultation and dressing rooms to care for minor complaints, and on the second and third floors will be rooms to care for those so sick as to be confined to bed. The third floor will also provide space for operating room and X-Ray equipment.

**Pattern Shop.** This is a one-story brick building 38 feet by 120 feet. A tool room is partitioned off at the center of the main floor. A fireproof

pattern storage room is placed at one corner. A commodious attic furnishes storage for lumber and other shop supplies. A line of columns through the center of the building supports the attic floor and also the main line of shafting. The building is steam-heated.

**Plant Industry Building.** This building was completed in 1915. It is of Bedford stone, 50 feet by 70 feet, three stories and basement. It contains several well lighted and well equipped laboratories for the accommodation of courses in plant propagation, truck and market gardening, floriculture, landscape designing, pomology, and research work.

**Rifle Range.** This is a temporary frame building erected to supply the pressing need for some place to hold instruction in rifle practice. Being merely an emergency arrangement until an armory can be constructed, it accommodates less than one-fifth of the students taking military instruction.

**Sanitary Hall.** A two-story brick building, containing offices, kitchen, dining room, and living rooms for sick and convalescent hospital patients.

**Science Building.** The Science Building is a portion of a wing of what is planned to be a much larger structure to house the various branches of Biology. The part now constructed is a building 49x114 feet with four stories and a basement. The first and second floors are occupied by the department of Bacteriology and Hygiene. The third and fourth floors house the work in General Zoology, Embryology, and Human Physiology. The building was planned primarily with laboratory needs in mind. All student laboratories open to the north and are supplied with an abundance of light. The building is unusually complete in equipment and facilities for both undergraduate and graduate work.

**Station Barn.** The Experiment Station barn is a large modern building veneered with buff pressed brick, with a slate roof, and paved brick floors. It is devoted to the housing of beef-cattle and horses and to the storage of vehicles and machinery. It is also used as a storage and grinding room for feed, and for seed rooms for the drying of corn and the storage of grain and feed stuffs used in experimental work.

**Steam and Gas Laboratory.** This is a brick building 55 feet by 165 feet, of the main floor and balcony type of construction. The roof is of steel and reinforced concrete tile; the floors are of tile and concrete. The east end is full two-story construction and contains offices, class rooms, and report rooms. Overhead steel coal bunkers with a capacity of 80 tons are placed under the boiler room roof. Toilet and supply rooms are placed in the basement. A pipe tunnel 10 feet high extends through the center of the building below the main floor. Oil and gas analysis rooms are located on the balcony. The building is steam-heated. A circular brick stack 125 feet high with a flue 44 inches in diameter furnishes draft for the boilers.

**Superintendent's Office.** This is a small two-story brick building about 40 by 36 feet in size, used for offices for the superintendent.

**Transportation Building.** This building consists of two wings, one measuring 50 by 100 feet, which is used for class rooms, drawing rooms, and laboratories in connection with work in railway engineering, highway engineering, and automobile engineering. Another wing, measuring 43 by 120 feet, is used for a locomotive testing laboratory. In this building is installed equipment to test any locomotive now built. The services of this laboratory are available to any railroad that cares to take advantage of the opportunities it offers. It is the most modern plant of its kind, and serves a large field, as it is the most western plant in the United States. There are only six other plants in the world, and but one of them as large as this one. In the Transportation Building is also an automobile testing plant which is used in connection with courses in automobile engineering. This plant can be used to test any truck or high speed automobile now made. The cost of the building, completely equipped, is $100,000.

**Veterinary Administration Building.** In this building are located the Dean's general and private offices, faculty room, surgeon's office, assembly room with seating capacity for two hundred and fifty, library, and librarian's office. These occupy the first and second floors. In the basement are storerooms for department supplies, together with storerooms and the shipping department of the State Biological Laboratory.

**Veterinary Anatomy Building.** This building, occupying the northwest section of the veterinary group, contains an amphitheatre class room, a well-lighted dissecting room with all the apparatus and exhibits necessary for the work, a private laboratory room, and a histological laboratory with desks for thirty-six students. It is occupied by the Department of Anatomy and Histology.

**Veterinary Hospital.** The hospital is a three-story brick building, fitted with well lighted single and box stalls, operating rooms, office and pharmacy, resident surgeon's room, etc. It is well furnished with all the surgical instruments of modern construction, operating table, and other important conveniences for clinical as well as for general hospital work.

**Veterinary Pathology and Bacteriology Building.** The north-east building of the Veterinary group is devoted to the work in pathology. bacteriology, and meat inspection. It comprises two offices, a private laboratory for individual research work, a large class room, and a large general laboratory in connection with which are pathology preparation rooms, a sterilizing room, and an incubating room.

**Veterinary Physiology and Pharmacology Building.** This building forms the south-east corner of the Veterinary group. In it may be found three modernly equipped laboratories, a large class room, a private laboratory and dark room, preparation room, experimental animal room, and store rooms.

**West Hall,** the first of the new dormitories for women, is situated on a knoll east of the central campus. The building contains 44 double rooms and 10 single rooms, accommodating 98 young women. It is of the latest

brick construction with slate roof and is strictly fireproof. It is provided with steam heat, electric lights, baths, and showers, and has large parlors. In the basement are recreation room and kitchenette.

**Other Buildings.** Stables, barns, and seed houses, sufficient for the requirements of the farm, are conveniently grouped near the College campus.

## EMPLOYMENT FOR STUDENTS

Although this institution is not situated in a large center where there is an unlimited amount of employment for students, yet there are a large number who earn a part of their expenses here at college Very few are able to make all their expenses, and no young man should come expecting to do this unless he has made definite arrangements ahead of time.

The work available for students consists of employment in the various departments, such as office work, caring for stock, helping in dairy, greenhouses, orchards, shops, or janitor work about the buildings. Considerable work for students is also obtained in the business houses and homes of Ames; a limited number find employment in student clubs and in the cafeteria.

The Employment Bureaus are managed as follows: For men, by the Young Men's Christian Association. Regular work for women, Mrs. Cunningham, Advisor to women; odd hour jobs for women, the Young Women's Christian Association. The heads of various departments are able to secure employment for large numbers of students during the summer vacation. Such positions give the students practical work that is closely related to the instruction given in college, and thereby strengthen them for service after graduation.

During the present year several hundred students have found work through the Association Employment Bureaus. It is suggested that, on account of the heavy laboratory work required in the courses here, students should not come expecting to put in too much time in labor. Facts regarding opportunity for work at the college can be had by writing Secretary, Y. M. C A, or Miss Ott, Secretary of the Y. W. C. A, or Mrs. Emily Cunningham.

### Manual Labor

The following regulations in regard to manual labor have been adopted by the Board of Education:

1. The manual labor of students is divided into two kinds: uninstructive labor, which shall be paid for in money; and instructive labor, which shall be conpensated by the instruction given and the skill acquired.

2. Uninstructive labor shall comprise all the operations in the workshop, the garden, upon the farm, and elsewhere, in which the work done accrues to the benefit of the College, and not to that of the student. Instructive labor shall embrace all those operations in the workshop, museum, laboratories, veterinary hospital, experimental kitchen, gardens, experi-

mental stations, and on the farm,—labor in which the sole purpose is the acquisition of knowledge and skill

3. Students shall engage in instructive labor in the presence of the professor in charge, and under his instruction according to the statement made in each of the courses of study.

The compensated labor furnished by the divisions of Agriculture, of Veterinary Medicine, and of Engineering, is given by each to its own students and is eagerly sought. Compensated labor is awarded to the most faithful and meritorious students in each department. This labor is paid for according to its value to the College, but no student should expect to pay the main part of his expenses by labor while here. The College cannot furnish the work, and, even if it could, the student's time is *needed chiefly for study* Still, many worthy and industrious students pay a considerable part of their expenses by labor; over $25,000 is paid out by the College thus each year to students and graduate assistants

## HOSPITAL

Sanitary conditions surrounding the College are excellent. The buildings are situated on high ground with good natural drainage. The water supply is exceptionally pure and abundant. The sewer system and sewage disposal plant are the best that modern sanitary engineering can devise. Nevertheless in this, as in other like institutions, where students are drawn from a wide territory, various diseases are brought by the students themselves In order to control epidemics and properly to care for other cases of illness or injury, a hospital is provided A new hospital of 45 beds capacity with a large dispensatory and all modern conveniences is being constructed In connection with this is the old hospital of 18 beds for special cases. This hospital is under the charge of the College physician, assisted by two registered nurses, a competent housekeeper, and a student hospital steward.

The expenses of the hospital are defrayed from a fund accruing from the fees paid by students. The privileges of the hospital are extended to all students who pay the full incidental fee of $10 00 or more, provided that the physician shall be paid for calls at their residences. Persons not making the deposit will be admitted to the hospital upon the basis of a charge of $15 00 a week, within the discretion of the College physician. All students who pay the full regular fees are insured medical attendance, nursing, and medicine, in illness or accident; and consultation and medicine for minor ailments in accordance with the regulations herein published. The charges named are based upon the probable actual cost of medical attendance and hospital service, and the fund created is carefully devoted to these purposes. The College can not assume any liability beyond the extent of the fund so created. The hospital has proved to be a great blessing to the students.

The following regulations appiy to the privileges of the hospital:

1. Students entering the hospital shall be charged $5.00 a week for

board, room, light, and heat. But for any time in excess of three consecutive weeks spent in the hospital, a charge shall be made of $1.00 a day.

2. In case a special nurse or physician is employed, the expense shall be borne by the particular patient, the selection of such nurse or physician to be approved by the College physician.

3. The College assumes no responsibility whatever in case of smallpox; nor shall the privileges of the hospital be extended to such cases.

4. The President and the College physician may require of students entering the college a certificate of a reputable physician showing successful vaccination. On account of prevalence of small pox in some localities in the United States, it is strongly urged that all students entering Iowa State College be vaccinated before leaving home. This is recommended in order that valuable time may not be lost during the college year by the necessity of being vaccinated.

5. The College physician is authorized to exclude from the College dormitories and recitation rooms any person afflicted with a contagious disease.

## ALUMNI ASSOCIATION

The Alumni Association of the Iowa State College was organized in 1876. Its purpose is to promote the highest interests of the institution and to increase friendship and sympathy among students and alumni.

The present officers of the association are:

Honorary President, E. W. Stanton '72, Ames, Iowa.
President, Geo. A. Smith '99, Des Moines, Iowa.
Vice President, Claude V. Campbell '04, Jewell, Iowa.
Recording Secretary, Loretta (Williams) Webster '06, Ames, Iowa.
Treasurer, Herman Knapp '83, Ames, Iowa.
General Secretary, Ward M. Jones '97, Ames, Iowa.

The annual meeting and banquet is held on Tuesday and Wednesday of commencement week. A local association was organized at Ames in April, 1903, in order to arrange the annual meetings and to keep the local alumni in touch with one another.

Active local branches of the general association exist in Southern and Northern California, Washington, D. C., Pittsburgh, Chicago, St. Louis, Seattle, Minneapolis and St. Paul, Omaha, New York City, Kansas City, Detroit, Spokane, and Oklahoma City; in the state, at Des Moines, Sioux City, Davenport, and in the following counties: Muscatine, Van Buren, Black Hawk, Dallas, Clinton, and Cerro Gordo.

The Alumnus, the official organ of the association, appears monthly except in August and September. It is under the supervision of the general secretary.

The offices of the association are on the second floor of Alumni Hall, where all alumni and ex-students will find a hearty welcome.

## STUDENT AND ALUMNI PUBLICATIONS

The I. S. C. Student is a tri-weekly newspaper published by a staff appointed from the student body and devoted to the news of the college.

The Bomb is an annual published by the Junior class.

The Iowa Agriculturist is an agricultural monthly magazine published by the students of the Agricultural division, in coöperation with the Department of Agricultural Journalism.

The Iowa Engineer is published monthly by the Engineering Society.

The Alumnus, a monthly publication, is devoted to and published by the Alumni Association.

## PUBLIC SPEAKING COUNCIL

The Public Speaking Council is an organization composed of three faculty members recommended by the President of the College and appointed by the Board of Education; and one representative from each of the ten literary societies, the sophomore, the junior, and the senior classes, and the Dramatic Club. The Council promotes and manages all dramatic and public speaking activities at Iowa State College. These activities include intersociety and intercollegiate debates, dramatic, oratorical, and extempore speaking contests, joint literary society programs, literary society graduation exercises, and all class plays.

Teams of three members from each of the societies meet in two series of debates during the fall semester. In the spring the successive winners meet in the semi-final and final debates for the Kennedy cup. The final winners are awarded the cup for one year, and the name of their society is inscribed upon it. This series of debates offers excellent training for the intercollegiate debates. Iowa State College is a member of two debating leagues. In the fall two debating teams of three students meet Kansas Agricultural College; in the spring, Purdue University and Michigan Agricultural College.

There is a growing interest in extemporaneous speaking in Iowa State College. The members of the faculty have donated to the Council a trophy to be awarded annually to the winner of the extempore speaking contest.

The sophomore, junior, senior, inter-literary society, and dramatic club plays offer training in dramatics to a great many students. The funds from these plays pay a large part of the expenses of public speaking events.

## LITERARY SOCIETIES

The work of the ten literary societies serves not only to supplement the social and literary work of the College, but also to aid the student in securing that training so necessary to enable him to appear before an audience, that training which every student needs and which cannot be secured in the class room alone. It is the purpose of the officers of the College to

keep each Friday evening open until half past eight that the work of these societies may go forward without interruption. Every student is invited, even urged, to join one of these societies.

## LECTURES AND ADDRESSES

The following lectures and addresses were given before the students without charge during the spring and fall semesters, 1917:

Jan. 5—Charles A Payne, Milwaukee, "Beautiful Hawaii."

Jan. 7—Dean Shailer Mathews, Chicago, Sunday Chapel Address; Y. M. C. A.

Jan. 14—President C P Colgrove, Upper Iowa University, Sunday Chapel Address.

Jan. 19—Lorado Taft, Chicago Art Institute, "Civic Art."

Jan. 21—Dr. W. H. Spence, Ft Dodge, Sunday Chapel Address.

Feb. 11—Bishop Homer C. Stuntz, Omaha, Sunday Chapel Address.
Attorney General H. M Havner, Des Moines, Y. M C. A.
Miss Cecile Long, Chicago, Y. W. C. A.

Feb. 14—Art Institute of Chicago, Exhibit and Lecture.

Feb. 16—E. S. Shortess, Engineering Extension Department, "The Philippines."

Feb. 23—H. E. Morrow, State Center, "Mexico"

Feb. 24—Stuart Walker, Manager Portmanteau Theater, "The Drama."

Feb. 28—F. S. Dewey, Muscatine, "Engineering Opportunities in Public Utilities."

March 1—Miss Mary Agnes Best, New York, "The Molly Best Stories."

March 1—Frank P. Graves, University of Pennsylvania, "The Great Public Schools of England."

March 4—Frank P. Graves, Sunday Chapel Address, "What is Character?"

March 11—Dr Allen Hoben, University of Chicago, Sunday Chapel Address.

March 18—Rev. Dr F. W. Evans, Council Bluffs, Chapel Address.

March 21—W. T. Whalen, Westinghouse Electric Company, "Steam Road Electrification."

March 25—Dr A. B. Storms, Indianapolis, Sunday Chapel Address.

April 1—Harry White, Mesopotamia, Y. M. C. A.

April 2-3—Miss Alice Ravenhill, London, England, Chapel, "Factors in Human Efficiency;" Home Economics Convocation, "Thrift in Modern Life."

April 12—Dean C. F. Fordyce, University of Nebraska, "Better College Teaching."

April 15—Dr W. H. Spence, Ft. Dodge, Sunday Chapel Address, "Equipment and Aquitment."

April 22—President Hill M. Bell, Drake University, Sunday Chapel Address, "Some Observations on Nation Building.

April 29—Rev. E. M. House, Chicago, Sunday Chapel Address

May 3—Prof. Louis G. Michael, University of Wisconsin, "The Russian Zemstvo and the Revolution," auspices of Alpha Zeta; "An American Ag. in Russia," auspices of Ag. Club.

May 6—Rev. William B. Sanford, Des Moines, Sunday Chapel Address, "The New Patriotism."

May 13—Dr. Howland Hanson, Des Moines, Sunday Chapel Address, "The Sure Foundation of a Shaking World."

May 14—Dr. J. M. Coulter, University of Chicago, annual Phi Kappa Phi address.

May 16—Prof. Leon J. Cole, University of Wisconsin, "Some New Aspects of Heredity," auspices Gamma Sigma Delta.

May 20—Dr. William J. Davidson, Northwestern University, Sunday Chapel Address.

May 23—Dr. H. F. Evans, Chicago Tribune Health Department, Convocation Address, "Health and Military Life."

May 26—Rev. E. T. Hagerman, D. D., Des Moines, Chapel Address.

June 3—Dr. Edward A. Steiner, Grinnell College, Baccalaureate Sermon.

June 6—Ex-President William H. Taft, Commencement Address.

Sept. 16—A. J. Elliott, Y. M. C. A. Address.

Sept. 23—Miss Ely, Des Moines, "Work of Y. W. C. A. at Camp Dodge."

Sept. 30—Fred Ingvolstadt, Y. M. C. A. Address.

Oct. 9—F. G. Ashbrook, Washington, D. C., "The Government Plan for Increasing Swine Production."

Oct. 14—Dr. Herbert F. Evans, Grinnell.

Oct. 18—Merritt Green, Marshalltown, Iowa, Farmer, "Agriculture in Cuba."

Oct. 19—Wilbur M. Chapman, New York City, "Forces that Build Character."

Oct. 21—Miss Agnes Hall, Minneapolis, Y. W. C. A.
Dr. Evans, Y. M. C. A. Address.

Nov. 4—Mr. Fred Hanson, Camp Dodge, "What is Expected of Women During the War," Y. W. C. A. Address.
Dr. E. A. Bess, Y. M. C. A. Address.

Nov. 11—Prof. F. C. Eiselen, D. D., Northwestern University.
Ben C. Overbeck, Y. M. C. A. Address

Nov. 18—Rev. Fifield, Yankton, South Dakota, "The Student in Wartimes."

Nov. 21—Frederic C. Howe, Commissioner of Immigration, Ellis Island, N. Y., "After the War, What"

Nov. 25—Alfred M. Brooks, University of Indiana, "The Gothic Cathedrals of Belgium as they were originally and as they are now."

Nov. 25—Rev. Father Nugent, Des Moines.

Nov. 25—Miss Eliza Butler, New York.
Miss Cora Adams, Minneapolis.
Miss Edith Helmer, Minneapolis.
Miss Agnes Hall, Minneapolis.
Dr. Yarrus, Chicago, Y. W. C. A. Conference for High Schools.
C. E. Biglow, Y. M. C. A. Address.

Dec. 2—Rev. Dr. S. T. Foster, Cedar Rapids.

Dec. 2—Dr. Warren H. Wilson, Columbia University, Y. M. and Y. W. C. A.
Dec. 6—Lieut. Bert Hall, "Fighting in France, Russia, and Roumania."
Dec. 9—Rev. Dr. M. A. Allison, Madison, Wis.
Foster A. Smiley, Y. M. C. A. Address.
Dec. 16—Dr. E. T. Cook, Y. M. C. A. Address.
Dec. 18—Pres. Lyman Wilbur, Leland Stanford University, "Food Conservation: Necessity for Calling the Continuous Attention of the People of the United States"
Jan. 6, 1918—Dr. Wm. Shoemaker, Y. M. C. A. Address.
Jan. 10—S. A. Sykes, Ida Grove, Pres. Corn Belt Meat Producers Ass'n, "Meat Production in the Corn Belt."
Jan. 10—Mme. Harriet Labadie, Reading, Ibsen's "A Doll's House."
Jan. 13—Dr. W. R. Shoemaker, Y. M. C. A.
Jan. 18—Norman Angell, London, England, "American Policy at the Settlement."
Jan. 20—E. A. Fridell, Y. M. C. A. Address.
Jan. 28—Special Addresses during the Winter Short Course.

## SCHOLARSHIPS AND FELLOWSHIPS

**Department of Agriculture Scholarships.** See page 47.

**The Clay, Robinson & Company Fellowship.** See page 48

**Tuition Scholarships.** See page 39.

**Graduate Fellowships and Scholarships.** See page 62.

**Story County Alumni Association Scholarship.** The Story County Alumni Association will provide suitable recognition each year to the Senior student receiving the highest honors in scholarship.

**Zimmerman Memorial Prize.** See page 48.

## TEACHERS' CERTIFICATES

**State Certificates.** In accordance with the law passed by the Thirty-first General Assembly, the State Board of Educational Examiners will grant five-year first grade state certificates to graduates of the Iowa State College who have completed the following work:

1. Psychology, six semester hours.
2. Education, fourteen semester hours.

a. Principles and science of education. Limited to eight semester hours.

b. History of education. Limited to eight semester hours.

c. General and special methods of teaching. Limited to four semester hours. Two hours of general methods must be taken.

NOTE: Under this head accredited colleges may offer courses in methods of teaching secondary subjects to students who have made majors of these subjects.

d. Electives, subject to the approval of the Department of Agricultural Education: History of Industrial and Vocational Education; Child Study; History of Philosophy; Organization of the High School; The High School Curriculum; The High School Student; Secondary Education; Supervision or School Administration.

NOTE: No credit will be given for any course in Education which requires less than two hours in one semester.

NOTE: A college may offer Psychology as early as the Sophomore year and not to exceed six semester hours of work in Education in the first two years.

The First Grade State Certificate is subject to renewal and life validation.

**Third Grade State Certificate.** The Third Grade State certificate is issued to graduates of the Iowa State College who have not completed the 6 semester hours in psychology and 14 in education required for the First Grade State Certificate. The third grade certificate is not renewable.

It is recommended that a person desiring to teach shall elect the courses which will secure the regular five-year state certificate upon graduation. This will entitle him to teach any subject and also hold any position in the high school.

For the courses which count toward the five-year state certificate see notes under Agricultural Education and Psychology in this catalogue.

**Special Uniform County Certificates.** To a graduate of any four-year course in the Iowa State College may be issued a special uniform county certificate for his major subject or for his major or minor subjects, without examination.

A person wishing a special certificate should send a copy of his college record to the President of the Educational Board of Examiners, Des Moines, Iowa. If the record is approved for the kind of certificate requested, a statement to that effect, together with an application blank, will be mailed to the applicant. The application, together with a fee of $1.00, should be presented to the county superintendent of the county in which the applicant has been teaching or of the county in which he expects to teach, who will mail it to the President of the Educational Board of Examiners.

A special uniform county certificate may be issued for any one or two of the following subjects or groups of subjects: music, drawing, domestic science or home economics, manual training, German, French, physical culture, rhetoric, English composition, English and American literature, history and political science, algebra, geometry, trigonometry, physiology, geology, botany, zoology, physics, chemistry, astronomy, and agriculture.

**Provisional Certificates.** Any student who is not a graduate, but who has completed at least one full year of regular college work, may receive a provisional certificate good for one year and not renewable. This certificate is secured through the county superintendent of the county where the applicant will teach, and requires that a full statement of the college work completed be submitted to such county superintendent.

### Certificates in Other States

Students finishing the course in agricultural education are prepared to meet educational requirements for certificates in other states. Only a few of the states require as much as 20 hours. Some of the requirements of neighboring states or states to which our graduates have been going are as follows: Illinois, 6 hours (in education); Utah, 9 hours; Kansas, Minnesota and South Dakota, 15 hours; Idaho and Nebraska, 16 hours; Missouri, 18 hours; Colorado, 20 hours; California, a fifth year with at least 15 hours in education and psychology; Ohio, 30 hours.

Most of the states require fundamental courses such as Agricultural Education 1 and 2, and work in practice teaching. However, the details of requirements vary somewhat, and a student who plans definitely to go to a particular state should inform himself with reference to its requirements in order that a teacher's certificate may be secured upon graduation. Since the fall of 1915 all schools in the North Central Association of colleges and secondary schools have required 11 hours work in education as well as college graduation. Since the North Central Association includes the stronger high schools throughout this section, it means much to be able to meet this requirement and be in position to become an applicant for work in schools belonging to the association.

### Recommendation of Teachers

The teacher's Appointment Committee of the college has been organized to aid adequately prepared students and graduates in securing positions as teachers. The Committee at the same time endeavors to give service to superintendents and school boards who are in need of teachers. Because of the large amount of work required of this committee, it has been found necessary to secure registration of interested students directly after the Christmas holidays. The committee is composed of representatives of all of the divisions of the college, the chairman of the committee being the head of the Department of Agricultural Education. The services of the committee are free, and all calls for teachers are referred to it.

## RELIGIOUS LIFE AT THE COLLEGE

Orange Howard Cessna, Chaplain
Raymond Sayer, Acting General Secretary, Y. M. C. A.
Sina C. Ott, General Secretary, Y. W. C. A.

The college life is permeated with religious influences. The following are among the more evident moral and religious forces in operation throughout the year.

1. **The Sunday Morning Chapel Services** are held in Agricultural Hall auditorium and are addressed by prominent clergymen of all denominations who accept special invitations to come to the college for this purpose. These services are well attended. Often the hall is filled to its capacity of nearly 900. An attractive feature is the music furnished by a choir of college students.

2. **Daily Chapel Service,** from 7:45 to 8:00 o'clock five mornings of the week, is conducted by the college chaplain with different members of the faculty assisting. Prominent visitors to the college are often heard. Attendance at this service is voluntary.

3. **The Y. M. C. A. and the Y. W. C. A.** are quartered in Alumni Hall on the campus and have regular secretaries. Last year over 85% of the young women students belonged to their association. The associations conduct Bible classes in sororities, fraternities and boarding houses. These classes are well attended. Special religious services are held under the direction of prominent Association leaders.

There are in active operation a Catholic Students' Association, a Luther League, and Brotherhood of St. Andrews.

4. **College Pastors.** Four churches now maintain college pastors at Ames, the Methodist, the Presbyterian, the Baptist and the Congregational. These men work in conjunction with their churches and with the religious organizations on the campus. They are exerting a helpful influence.

5. There are ten different **denominational churches** of Ames, all of which are in touch with the students, who are cordially invited to take part in all religious services.

## Geneva Scholarship

The Faculty Women's Club contributes each year a fund sufficient to cover the expense of a delegate to the Y. W. C. A. Central Student Conference at Lake Geneva, Wisconsin. This fund constitutes a scholarship which is awarded the second semester of the sophomore year. Scholarship, accomplishment in Y. W. C. A. work, interest in general college activities, and personality are considered in making the award of this scholarship.

## Floriculture Prize

A fund has been established by holding in deposit the premiums won at the Flower Shows through the exhibition of flowers and plants grown at the College Greenhouses. The income of this fund will be awarded to the student in floriculture who shows the greatest understanding and practical knowledge of floriculture. The basis for determining the award will be a problem in the organization and management of a commercial florist's business. If the judges consider the work of no competitor is deserving, the prize will not be awarded and the income will be added to the fund.

# Honor Students

## FORENSIC CONTESTS

### Intersociety Debates

### Kennedy Cup Contest, Fall Semester, 1917

The winning society is named first in each contest.

Question: Resolved, that the Federal Government immediately take steps to acquire and operate the coal mines as a permanent policy.

FIRST SERIES

Philoypthian—W. C. Lawler, F. J. Kloser, A. A. Sather.
Welch-Forum—B. L. Warick, P. E. Treman, A. J. Lee.
Beardshear—Leon Foiles, Kirk Dewey, Horace Harper.
Delphian—Hazel B. Corneliussen, Hazel Criswell, Gladys Irwin.
Crescent—Mercedes Peters, M. R. Irwin, Helen Trexel.
Bachelors—A. G. Olson, J. L. Murphy, W. Brett.

SECOND SERIES

Quills—Jessie Welch, Laura Seward, Iona Bair.
Crescent—Mercedes Peters, M. R. Irwin, Helen Trexel.
Philopythian—W. C. Lawler, F. J. Kloser, A. A. Sather.
Beardshear—Leon Foiles, Kirk Dewey, Horace Harper.

THIRD SERIES

Philopythian—W. C. Lawler, F. J. Kloser, A. A. Sather.
Quills—Jessie Welch, Laura Seward, Iona Bair.

### Intercollegiate Debates

FALL SEMESTER, 1917

Fifth debate with Kansas State Agricultural College.

Question: Resolved, that in the corn belt it is more essential to the welfare of the tenant farmer to improve the methods of renting land than to improve other methods of acquiring ownership.

| Affirmative for Iowa State College at Ames: | Negative for Iowa State College at Manhattan: |
|---|---|
| Guy Peterson | H. W. Biedermann |
| Grant Clark | M. W. Emmel |
| R. H. Porter | Howard Peterson |

Decisions: At Ames—Affirmative 3 At Manhattan—Affirmative 3
Negative 0 Negative 0

SPRING SEMESTER, 1918

Fourth triangular debate with Michigan Agricultural College and Purdue University.

Question: Resolved, that the Federal government immediately take steps to acquire and operate the coal mines as a permanent policy.

Affirmative for Iowa State College at Ames:
F. J. Kloser
J. L. Murphy
J. A. Elwell

Negative for Iowa State College at East Lansing:
W. C. Lawler
Guy Peterson
Charles C. Heezen

### Missouri Valley Oratorical Contest

Iowa State College represented by R. H. Porter. Subject: The Challenge of the New Age.

### Declamatory Contest

FALL SEMESTER, 1917

| Men | Women |
|---|---|
| First—Earl Penny | First—Julia Lustfield |
| Second—Fred Ferguson | Second—Vera Bass |
| Third—R. E. Naylor | Third—Josephine Dunton |

## ROSTER OF CADET CORPS

Gen'l J. R. Lincoln, Commandant.
Col. Chas. Byrne, Prof. Military Science and Tactics.
Maj. D. W. Tubbs, Chief of Engineers.
Capt. Z. R. Mills, Regimental Adjutant.
Capt. H. C. James, Regimental Quartermaster.

### Engineer Corps

Capt. R. P. Blodgett.
Capt. F. J. Rasmusson.
1st Lt. R. F. Carter.

### Infantry

Col. A. L. McMillan.

### First Battalion

Major, H. J. Helm; Adjutant, R. W. Colbert; Quartermaster, R. Dunham.

Co. A—Captain, R. Strader; .st Lt., L. W. Wood; 2d Lt., H. R. Merriam.

Co. B—Captain, H. T. Woodward; 1st Lt., P. H. Tingeliff; 2d Lt., E. A. Swanson.

Co. C—Captain, J. R. Mudge; 1st Lt., R. D. Bennison; 2d Lt., F. C. Poage.

Co. D—Captain, A. M. Deyoe; 1st Lt., C. E. Bosch; 2d Lt., K. Gobble.

### Second Battalion

Major, Ed. Roddewig; Adjutant, C. H. Dye; Quartermaster, E. W. Lowe.

Co. E—Captain, P. A. Warner; 1st Lt., B. W. Wheelwright; 2d Lt., F. P. Hanson.

Co. F—Captain, L. P. Arduser; 1st Lt., J. L. Murphy; 2d Lt., C. P. Heuck.

Co. G—Captain, W. B. Nelson; 1st Lt., W. J. Peterson; 2d Lt., H. W. Spicer.

Co. H—Captain, M. R. Irwin; 1st Lt., K. Dewey; 2d Lt., J. Currie.

### Third Battalion

Major, M. W. Emmel; Adjutant, F. E. O'Malley; Quartermaster, Geo. E. Rath.

Co. I—Captain, C. Mershon; 1st Lt., D. V. Moses; 2d Lt., B. W. Schroeder.

Co. K—Captain, H. L. Hutchinson; 1st Lt., M. M. Sheldon; 2d Lt., C. O. Drennan.

Co. L—Captain, R. E. Snyder; 1st Lt., C. H. Beckman; 2d Lt., H. L. McCleery.

Co. M—Captain, D. R. Theophilus; 1st Lt., L. Hamilton; 2d Lt., V. K. King.

### Signal Corps

F. B. Sisler, Instructor in Charge

Major, L. G. Wilhelm — Adjutant, K. M. Wood

Quartermaster, A. S. Osgood

| 1st Company | 2d Company |
|---|---|
| Capt., L. Gordon | Capt., J. L. C. Vannoy |
| 1st Lt., R. S. Toman | 1st Lt., Sylvester Coe |
| 2d Lt., Lee Gallup | 2d Lt., H. C. Bosch |

### Hospital Corps

Major, H. F. Jager — Capt., M. Ingwerson

Adjutant, E. P. Carver — 1st Lt., H. Brenton

### Military Band

Director, T. D. Collins — Drum Major, Burnard Martin

## WINNERS OF SPECIAL PRIZES AND MEDALS

### Phi Lambda Upsilon Thesis Medal

Winner—F. Earl Parsons, Horticulture.

### Phi Kappa Phi Prize

Winner—Miss Jessie Welch, Industrial Science.

### Zimmerman Memorial Prize Medal

Winner—Leroy S. Goods, Horticulture.

### Story County Alumni Prize

Winner—William Alexander Aitken, Veterinary Medicine.

### Sons of American Revolution Medal

Winner—Miss Beulah B. Briley, Industrial Science.

### Lake Geneva Scholarship

Winner—Miss Jewell Tobin, Home Economics.

## SENIOR HONOR STUDENTS

### Class of 1917

William Alexander Aitken, Veterinary Medicine
Ruth Edson Dewey, Industrial Science.
Edwin William Stillwell, Horticulture
Anna Kate Keefer, Home Economics
Carl Jesse Myers, Mechanical Engineering
George B. Hartman, Forestry.
William A. Cordes, Dairying.
Joseph Leo Ahart, Agricultural Engineering
Robert Waldo Peterson, Agronomy.
Floyd F. DeButts, Animal Husbandry.
Karl Howard Runkle, Electrical Engineering.
Harold Ellwood Pride, Civil Engineering

# List of Students

## 1917-1918

### ABBREVIATIONS

| | | | | | |
|---|---|---|---|---|---|
| A.Ed | Agricultural Education | C.E. | Civil Engineering | Hort. | Horticulture |
| A.E. | Agricultural Engineering | Dy. | Dairying | I.S. | Industrial Science |
| Agr. | Agriculture | Ec.S. | Economic Science | Math. | Mathematics |
| A H | Animal Husbandry | E.E. | Electrical Engineering | M.E. | Mechanical Engineering |
| Ar.E | Architectural Engineering | Eng. | Engineering | Mn.E. | Mining Engineering |
| Bact. | Bacteriology | FC-S. | Farm Crops and Soils | Phys. | Physics |
| Bot. | Botany | F.M. | Farm Management | Soils | Soils |
| Cer. | Ceramics | For. | Forestry | V.M. | Veterinary Medicine |
| Ch.E | Chemical Engineering | Geol | Geology | Zool. | Zoology |
| Chem. | Chemistry | H.E. | Home Economics | | |

## GRADUATES

* Work taken in Summer School.

Dy. Ainsworth, Ernest C. (*B. S., So. Dak. State College*) Brookings, *South Dakota*
Phys. Anderson, Homer G. (*B. S., Rochester Univ.*) Linwood, *New York*
F.M. Andrews, Myron E (*B. S., Okla. A. & M. College*) Okeene, *Oklahoma*
Chem. Banks, Russell S. (*M. S., Ohio State Univ.*) Antwerp, *Ohio*
Chem. Bircher, Louis J. (*B. S., Univ. of Missouri*) St Louis, *Missouri*
Soils Bisig, J. F. (*B. S., Iowa State College*) Ames, Story
A.H. Brashier, E. S. (*B. S., Miss. A. & M. College*) Shulenta, *Mississippi*
Chem Brewer, Ralph E. (*B. A., Simpson College*), Indianola, Warren
Ec.S. *Briley, Beulah B. (*B.S., Iowa State College*) Ames, Story
Bact. Bruett, Evelyn (*B. S., Iowa State College*) Laurens, Pocahontas
A.H. Caine, Arthur H. (*B. S., Iowa State College*) Logan, *Utah*
A.E. Carter, Deane G. (*B. S., Iowa State College*) Ames, Story
Ec.S. Cessna, Blythe F. (*A. B., Grinnell College*) Grinnell, Poweshiek
Chem. Cessna, Ruth (*M. S., Columbia Univ.*) Nevada, Story
Chem. Chapman, O. W. (*B. A., Buena Vista College*) Correctionville, Woodbury
Phys. Chrisler, V. L. (*B. S., Univ. of Nebraska*) Dermect, *Georgia*
Bot. Cilley, Edwin C. (*B. A., Grinnell College*) Independence, Buchanan
Bact. Clark, Clarissa (*B. S., Iowa State College*) Ames, Story
Math. Coffin, Claren C. (*B. A., Penn College*) Oskaloosa, Mahaska
Dy. Cordes, William A. (*B. S., Iowa State College*) Chicago, *Illinois*
F.C. Cox, Romeo W. (*B. S., Texas Agr'l College*) Ames, Story
Math. Daniells, Marian E. (*A. B., Chicago*) Kalamazoo, *Michigan*
Chem. Dielmann, Ray E. (*B. A. Southwestern College*) Winfield, *Kansas*
Bot. Dietz, S. M. (*B. S., Iowa State College*) Charles City, Floyd
F.C. Duddleston, Harrison (*B. S., Univ. of Wisconsin*) LaVelle, *Wisconsin*
Bot. Durrell, Laurence W. (*M. S., Iowa State College*) Ames, Story
Bot. Durrell, Mrs. L. W. (*A. B., Leander Clark College*) Ames, Story
A.Ed. *Edgar, Mary (*B. S., Iowa State College*) Ames, Story
Math. Farnum, Fay (*M. S., Cornell University*) Ames, Story
Soils Firkins, Bruce J (*B. S., Iowa State College*) Rollo, *Illinois*
A.E. Glass, John S (*B. S., Iowa State College*) Corydon, Wayne
Soils Halversen, W. V. (*M. S., Iowa State College*) Spanish Fork, *Utah*
Bact. *Harner, Robert M. (*M. A., Univ. of Kansas*) Sterling, *Kansas*
Math. Harmsen, Minnie D. (*B. S., Drake University*) Collins, Story
F.M. Harter, William L (*A. B., McPherson College*) Ames, Story
Hort. Hartman, Henry (*B. S., Wash. State College*) Wanatchee *Washington*
Zool. Hartzell, Albert (*M. S., Cornell Univ.*) Lebannon, *Pennsylvania*
Bot. Hayden, Ada (*M. S., Iowa State College*) Ames, Story
Chem. Hayes, Anson (*M. S., Iowa State College*) Ames, Story
A.H. Heppe, Waldo F (*B. S., Kansas A. & M. College*) Newton, Jasper
Bot. Hines, W. C. Lenard (*B. S., Iowa State College*) Traer, Tama
Zool. Hoffman, William Albert (*B. S., Cornell Univ.*) New York City, *New York*
Ec.S. Hulbert, Geo. William (*A. B., Univ. of Michigan*) Ann Arbor, *Michigan*
Math. Iverson, Palma (*A. B., St. Olaf College*) Madison, *South Dakota*
Bot. James, Dr. John James (*B. S., Iowa State College*) Pasadena, *California*
Chem. Kellems, T. Oscar (*B. S., Drake University*) Mt. Carmel, *Illinois*

A.E. Kelley, James Byron (*B. S., Iowa State College*) Ames, Story
Bot. Kendrick, James B. (*B. S., Clemson College*), Clover, *South Carolina*
Bact. Kintner, John Harold (*V. M. P., Univ. of Penn.*) Easton, *Pennsylvania*
Bot. Kirby, Robert S. (*M. S., Iowa State College*) Messilla Park, *New Mexico*
Chem. Kirk, Raymond E. (*M. S., Iowa State College*) Lincoln, *Nebraska*
Hort. Lantz, Harvey L. (*B. S., Ore. Agr'l College*) Cove, *Oregon*
Bact. *Laybourn, R. L. (*M. S., Iowa State College*) Crystal Springs, *Florida*
F.C. Lund, Viggo (*Grad. Royal Danish Agr'l College*) Delum, *Denmark*
A.H., McBride, Robert V. (*B. S., Okla. Agr'l College*) Fort Landesdale, *Florida*
Math. McKim, Elizabeth (*B. S., Iowa State College*) Ames, Story
Vet. McNutt, Samuel H. (*D. V. M., Iowa State College*) Ames, Story
Math. Madson, Nina A. (*B. S., Iowa State College*) Ames, Story
Dy. Merkley, Forby K. (*B. S. A., Ontario Agr. College*) Williamsburg, *Ontario, Canada*
A.H. Maynard, E. J. (*B. S., Iowa State College*) Providence, *Rhode Island*
Ec.S. *Miller, Cap E. (*M. S., Iowa State College*) Ames, Story
Chem. Montillon, G. H. (*B. S., Iowa State College*) Cedar Rapids, Linn
Chem. *More, Mrs. Sue B. (*M. S., Iowa State College*) Ames, Story
Dy. Morgan, Arthur R. (*B. S., Penn. State College*) Durham, *New Hampshire*
Hort. Murneek, A. E. (*B. S., Ore. Agr'l College*) Tilson, *Washington*
Chem. Naylor, Nellie M. (*B. A., Univ. of Iowa*) Ames, Story
Bact. Orr, Paul Frederick (*B. S., Okla. A. & M. College*) Lawton, *Oklahoma*
Zool. Park, Oscar Wallace (*B. S., Kansas Agr'l College*) Ames, Story
Bot. *Perry, Winfred (*B. S., Iowa State College*) Ames, Story
Bot. Plagge, H. H. (*B. S., Iowa State College*) Barrington, *Illinois*
Bot. Raeder, J. M. (*B. S., Iowa State College*) Colo, Story
Bot. Rees, Marie (*Ph. B., Univ. of Chicago*) Logansport, *Indiana*
Ar.E. Richardson, Lewis E. (*B. S., Iowa State College*) Webster City, Hamilton
F.C. *Robinson, Joe L. (*B. S., Okla. A. & M. College*) Omega, *Oklahoma*
Hort. Rudnick, Rudolph (*B. S., Iowa State College*) Ames, Story
Math. Sage, J. R. (*M. S., Rose Ply't Inst.*) Ames, Story
Bact. Salter, Raymond E. (*B. S., Univ. of Wisconsin*) Ames, Story
A.H. Savin, William Homer (*B. S., Delaware College*) Cheswold, *Delaware*
Dy. Schwark, Conrad Wallace (*B. S., Okla. A. & M. College*) Ames ,Story
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H E, Waters, Anne, Lohrville, Calhoun
H.E, Waters, Blanche, Lohrville, Calhoun
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A H, Williamson, Edmond D., Hopkinton, Delaware
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A H, Wood, Geo. W., Fontanelle, Adair
Ar.E, Wood, Loyd E, Monroe, Jasper
M E, Woodward, H. T, Des Moines, Polk
V.M., Wormley, Geo., Newton, Jasper
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| Hort., | Adams, Douglas P., Cherokee, Cherokee |
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| E.E., | Ambelang, Carl, Chariton, Lucas |
| H.E., | Ammons, Adda, Clarinda, Page |
| Ar.E., | Andersen, Alfred C., Council Bluffs, Pottawattamie |
| A.H., | Anderson, Robert, La Porte, Black Hawk |
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| M.E., | Arduser, Leon, Dubuque, Dubuque |
| A.H., | Arnold, Daniel G., Lewistown, *Pennsylvania* |
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Agr, Syndergard, Earl S., Cedar Falls, Grundy
Eng, Taylor, Charles, Lake City, Calhoun
Agr, Teachout, Raymond, Shenandoah, Fremont
Agr, Thielecke, Rehm E., Wilmette, *Illinois*
Agr, Thiesen, Margaret, Ames, Story
Agr, Thoene, Fred, Jr., St. Charles, *South Dakota*
Agr, Thomas, N. A., Norway, Benton
Eng, Thoreson, Jesse E., Ellsworth, Hamilton
H E, Tilden, Dorothy, Ames, Story
Agr, Tinkham, Lester, Cameron, Warren
Eng, Tow, Lincoln, Norway, Benton
Agr., Traenkenschuk, Fred G., Rock Island, *Illinois*
Agr, Trumbower, John, Shell Lake, *Wisconsin*
Agr, Turner, Ford D., Randalia, Fayette
Eng., Valett, Clarence A., Muscatine, Muscatine
Eng, Van Alstine, Fletcher, Gilmore City, Humboldt
Agr., Vieths, Lloyd, Jesup, Buchanan
Eng., Vondracek, Lumir J., Cedar Rapids, Linn
Eng., Warnke, Carl B., Ames, Story
H.E., Warwick, Mrs. Blanche T., Waterloo, Black Hawk
Eng., Watson, Ira E., Grand Rapids, *Minnesota*
Eng., Weatherby, Fred E, Buck Grove, Crawford
Eng., Wegner, Carl, Carroll, Carroll
Agr., Weiler, John R., Reinbeck, Grundy
Dy., Whisler, H. C., Ames, Story
Eng., White, Harry M., Cooper, Greene
Eng., Whiteman, Emmett, Waucoma, Fayette
Agr., Whittlesey, Charles F., Pioneer, Humboldt
Agr, Wiese, Albrecht E. G., Avoca, Pottawattamie

Dy., Wiklund, Alfred, Arlington, Fayette
Dy., Williams, Fred, Lee's Summit, *Missouri*
Engr., Williams, Geo. D., Keota, Keokuk
Agr., Wilson, Carl A., Traer, Tama
Agr., Wilson, Leroy, Sidney, Fremont
Agr., Winegard, Daniel R., Illinois City, *Illinois*
Agr, Wood, Harry E, Beverly, *Massachusetts*
Eng., Wood, Ralph W., Prescott, Adams
Agr., Woodcock, Philip H, Nutley, *New Jersey*
Eng., Woodin, Carl, Laurens, Pocahontas
Dy, Woodward, Cecil, Hamburg, Fremont
Agr, Woodward, Dan W., Villisca, Montgomery
Agr, Woodworth, James C., Rudd, Floyd
Agr, Wright, Julian, Jefferson, Greene
H E, Wunder, Lilly L., Laurens, Pocahontas
Agr, Wygle, L Arthur, Clarksville, Butler
Agr, Yates, Earle M, Palo, Linn
Agr, Year, George, Melvin, Osceola
Agr, Youngstrom, Alfred, Storm Lake, Buena Vista
Eng, Zarley, Ray E, Indianola, Warren
H E, Zenor, Leta M., Woolstock, Wright

## SIX WEEKS GARDEN CLUB LEADERS' COURSE

| *Name and Town* | *County* |
|---|---|
| Burton, Effie M, Cedar Rapids, | Linn |
| Ebert, Elsie, Burlington, | Des Moines |
| Glendy, G F, Clarion, | Wright |
| Mitchell, Iza, Keokuk, | Lee |
| Parmelee, Helen G, Iowa Falls, | Hardin |
| Troutner, Edith, Keokuk, | Lee |
| Wangelin, Fred G, Boone | Boone |
| White, Mrs. Ellen Van Putten, Sioux City, | Woodbury |
| White, Michael H, Sioux City, | Woodbury |

## MUSIC STUDENTS

Abbreviations and meanings—P, Piano; V., Voice, Vln, Violin, O, Organ
* Regular College students

| *Course* | *Name and Address* |
|---|---|
| V, | Allen, Julia, Sergeantville, *New Jersey* |
| *V, | Baumgarten, Elsie, Boulder, *Colorado* |
| *V, | Bartlett, Lois, Riceville, Mitchell |
| P, | Bartlett, Juanita, Ames, Story |
| V, | Benson, R A, Primghar, O'Brien |
| V, | Beyer, Mrs S W, Ames, Story |
| *P, | Clark, Blanche, Albia, Monroe |
| *V, | Clark, Hazel, Vinton, Benton |
| *V, | Coddington, W F, Smithland, Woodbury |
| *P, | Cory, Erma, Altoona, Polk |
| O, | Corneliussen, Cora, Ames, Story |
| *Vln, | Daniels, Fred J, Gilmore City, Pocahontas |
| *Vln, | Dean, Earl, Ames, Story |
| *Vln, | Dieterich, Adeline, Marshalltown, Marshall |
| *V, | Eder, Martha, Ames, Story |
| Vln, | Elliott, Ashley, Ames, Story |
| *P, | Ferguson, Francis, Laurens, Pocahontas |
| V, | Forbes E L, Mittauma, *Mississippi* |
| V & P, | Fults, Leon, Ames, Story |
| *Vln, | Furry, Margaret, Alden, Hardin |
| *V, | Gardner, Wade, Washington, Washington |
| V, | Graham, Carrie, Ames, Story |
| V & P, | Grossman, Grace, Ames, Story |
| *P, | Hansen, Walter R, Rock Rapids, Lyon |
| *V, | Hall, Edith, Glidden, Carroll |
| V, | Hartley, H L, West Liberty, Muscatine |
| *V, | Harvey, Marguerite, Clifton, *Colorado* |
| *V, | Henna, S W, Denmark, Lee |
| V & P, | Herzog, Otto, Ames, Story |
| *V, | Heidelberg, Lucile, Anthon, Woodbury |
| *V, | Holbrook, W F, Okmulgee, *Oklahoma* |
| *P, | Holst, Rose, Davenport, Scott |
| *V, | Hoopes, A G, Muscatine, Muscatine |
| *V, | Husted, A M, Ames, Story |
| *V, | Irwin, M R, Ireton, Sioux |
| *V, | Jones, Edna, Ames, Story |
| *V, | Jordan, Gladys, Ames, Story |
| P, | Key Florence, Ames, Story |
| *V, | Kline, Allen B, Dakota City, *Nebraska* |
| *V, | Kirk, Florence, Dunlap, Harrison |
| *P, | Klise, Nora M, Clarinda, Page |
| V, | Knudson, Clara, Hills, *Minnesota* |
| *V, | Lyman, Helen, Nevada, Story |
| *V, | Leaverton, Paul, Milton, Van Buren |
| *V, | Liljedahl, Mabel, Red Oak, Montgomery |
| *Vln, | Lorens, Leonard, Ogden, Boone |
| *P, | Marshall, C Ollie, Keokuk |
| *V & P, | Martin, Wm B, Denver, *Colorado* |
| *V, | Masters, Mary, Mapleton, Monona |
| *V, | Masters, Ervilla, Mapleton, Monona |
| P, | Miller, Theona, Metz, Jasper |
| V, | Morris, Mrs Edward, Ames, Story |
| *V, | Murphey, J L, Clear Lake, Cerro Gordo |
| *P, | Orcutt, Willard, Sioux City, Woodbury |
| *P, | Parsons, Mabel, Marshalltown, Marshall |
| *P, | Paschal, Helen, Melrose, Monroe |
| V, | Petsch, A M, Ames, Story |
| *V, | Perkins, Russell, Red Oak, Montgomery |
| *V, | Peterson, George M, Hancock, Pottawattamie |
| V & Vln, | Peterson, C Russell, Red Oak, Montgomery |
| *P, | Petesch, Edith, McHenry, *Illinois* |
| *V, | Phillips, Lois, Lu Verne, Kossuth |
| *V, | Price, Ralph F, Winfield, Henry |
| *P, | Rhodes, Helen, Baldwin, Jackson |
| *P, | Russell, Major, Creston, Union |
| *V, | Sailer, Matilda, Faulkner, Franklin |
| *V, | Seaton, Nan, Ames, Story |
| *P, | Sexauer, Mrs E A, Ames, Story |
| *V, | Seydell, Lillian, Harper, Keokuk |
| *V, | Schram, Verne, Burnside, Webster |
| *V & Vln, | Shirbroun, Mabel, Coon Rapids, Carroll |
| P, | Smith, Ruth, Ames, Story |
| *Vln, | Strevevsov, Albert, Vinton, Benton |
| *V, | Stratbucker, Louise, Omaha, *Nebraska* |
| *V, | Swenson, Florence, Dayton, Webster |
| *P, | Swenson, Florence, Batavia, Jefferson |
| *P, | Suss, Clara, Graettinger, Palo Alto |
| *P, | Spicer, H. W, Plainfield, New Jersey |
| *V & P, | Thornburg, Jennie, Ames, Story |
| *P, | Vannoy, J. L. C, Ackley, Hardin |
| *V, | Van Scoy, Marion, Logan, Harrison |
| *V, | Welton, G H., Wiota, Cass |
| *V & P, | Woodcock, Philip, Nutley, *New Jersey* |
| *P, | Wheater, Margaret, Marshalltown, Marshall |
| *V, | Wood, L. W., Traer, Tama |
| *V, | Zenor, Leta, Woolstock, Wright |

# FIRST SUMMER SESSION, 1917

**Also in Second Session

*Regular College Students

| Name and Town | County |
|---|---|
| *Abbott, Donald Aaron, Lamont, | Buchanan |
| *Adams, Harold E., Cedar Rapids, | Linn |
| Adams, Hattie L., Webster City, | Hamilton |
| *Adams, Marshall E., Quasqueton, | Buchanan |
| *Alcorn, Emma, Allerton, | Wayne |
| *Allen, Jessie Louise, Luther, | Boone |
| *Anderson, Andrew Emmett, Bourbonnais, | *Illinois* |
| *Anderson, Effie E., Boone, | Boone |
| *Anderson, Jennie, Dana, | Greene |
| *Anderson, May, Story City, | Story |
| *Annis, Betty, Council Bluffs, | Pottawattamie |
| *Artis, G. Hubert, Story City, | Story |
| *Apland, Pearl, Ames, | Story |
| *Armstrong, Avery, Ames, | Story |
| *Austin, Edwin Munroe, Los Angeles, | *California* |
| *Avery, N. A., Alexandria, | *South Dakota* |
| *Avery, Mrs. Osa, Ames, | Story |
| *R. C. Bailey, Atlantic, | Cass |
| *Bailey, Ruth, Custer, | *South Dakota* |
| *Baker, C. J., Casey, | Guthrie |
| *Baker, Margaret, Nevada, | Story |
| Baker, Mose, Edward, Des Moines, | Polk |
| *Balcer, Emma Elmira, Boone, | Boone |
| Bancroft, Mary B., De Soto, | Dallas |
| *Barker, Espy A., Jefferson, | Greene |
| *Barnett, Chas. L., Belle Fourche, | *South Dakota* |
| *Barnhart, Sadie, West Branch, | Cedar |
| *Barr, Mrs. Marian, Clinton, | Clinton |
| *Barrett, Madge, Mystic, | Appanoose |
| *Batcher, Ralph, Toledo, | Tama |
| *Baum, Barbara, Stone City, | Jones |
| *Beeman, F. B., What Cheer, | Keokuk |
| *Behrens, Wm., Pomeroy, | Calhoun |
| *Bell, Florence Maree, Murray, | Clarke |
| *Bell, John Hamilton, Dubuque, | Dubuque |
| *Belton, Merrill J., Algona, | Kossuth |
| Bergman, Maude Marie, Stratford, | Hamilton |
| *Berryhill, Judd, Kamrar, | Hamilton |
| *Bickel, Norman, Anamosa, | Jones |
| *Biederman, Henry W., Plymouth, | Cerro Gordo |
| *Binger, Frank M., Charles City, | Floyd |
| *Blanchard, Alice, Primghar, | O'Brien |
| *Bolles, D. C., Wellman, | Washington |
| *Boltenstern, Florence E., Ames, | Story |
| Boltenstern, Mrs. M. A., Ames, | Story |
| *Brask, Andreas, Sheldon, | O'Brien |
| *Braun, Roy Eldo, Prescott, | Adams |
| *Breitengross, Richard A., Grand Mound, | Clinton |
| *Briley, Beulah B., Ames, | Story |
| *Britten, Ruth, Ames, | Story |
| *Bromwell, Vincent George, Cedar Rapids, | Linn |
| Brooks, Viva Leona, Stratford, | Hamilton |
| *Brown, Jessie, Murray, | Clarke |
| *Brown, Lydia B., Ames, | Story |
| *Brown, Mabel E., Omaha, | *Nebraska* |
| *Buck, Ruth Helen, Bruce, | *South Dakota* |
| *Budd, Etta M., Ames, | Story |
| *Budd, Leila, Shellsburg, | Benton |
| *Buell, Grace M., Bedford, | Taylor |
| *Burch, Kendall, Dubuque, | Dubuque |
| **Burns, Martha Marie, Ames, | Story |
| *Burris, Merle, Garrison, | Benton |
| *Butts, Clifford E., Brooklyn, | Powshiek |
| *Byerhoff, Wilson G., Alexander, | Franklin |
| *Caille, Earle L., Sioux Falls, | *South Dakota* |
| *Cameron, Ada Anne, Ames, | Story |
| *Canfield, Georgia, Belleville, | *Kansas* |
| **Carlsen, Elise, St. Ansgar, | Mitchell |
| *Carmichael, N. Ray, Ames, | Story |
| *Carpenter, Edwin R., Brooklyn, | Poweshiek |
| *Carpenter, Mrs. T. L., Ames, | Story |
| *Carter, Mrs. Deane G., Ames, | Story |
| *Carter, Mae, Mystic, | Appanoose |
| *Caughlan, Marian W., Des Moines, | Polk |
| *Chamberlain, James Marlette, Davenport | Scott |
| *Chamberlain, Margaret, Boone, | Boone |
| *Chantry, Xela, Des Moines, | Polk |
| *Clark, B. Frank, Shannon, City, | Union |
| **Clark, Clarissa May, Ames, | Story |
| *Clarke, James Parker, Ogden, | Boone |
| *Clark, Priscilla R., Mystic, | Appanoose |
| Clark, Rebecca Louise, Adel, | Dallas |
| *Clark, Warren Pomeroy, Burlington, | Des Moines |
| *Conrad, Mayme E., Pulaski, | Davis |
| *Cook, Esther, Ames, | Story |
| **Cooney, Ida G., Everly, | Clay |
| *Cordiner, Dorothy, Emmetsburg, | Palo Alto |
| *Cordiner, Mary, Emmetsburg, | Palo Alto |
| *Courtwright, Leila, Ames, | Story |
| *Crary, M. A., Rinard, | Calhoun |
| *Crawford, Lois, Boone, | Boone |
| *Cromer, Irving J., Clinton, | Clinton |
| *Culver, Helen, Hubbard, | Iowa |
| *Curott, Harry G., Cedar Rapids, | Linn |
| *Davis, Elsie, Indianola, | Warren |
| *Davison, Carl L., Moulton, | Appanoose |
| *Dawson, John C., Ames, | Story |
| **Dean, Grace M., Ames, | Story |
| *Dean, Imogene, Ames, | Story |
| *Delaney, Francis J., Clinton, | Clinton |
| *De Marce, Margaret, Delta, | Keokuk |
| *Deming, M. H., Clarence, | Cedar |
| *Dick, Leon Kearn, Rockwell, | Cerro Gordo |
| *Dietz, S. M., Charles City, | Floyd |
| *Dock, Edna, Elmore, | *Minnesota* |
| *Dodds, Mildred, Ames, | Story |
| *Doggett, Maude M., Ames, | Story |
| *Douglass, Mrs. T. R., Ames, | Story |
| *Doty, Hiram S., Ames, | Story |
| *Draper, Olive May, Sutherland, | O'Brien |
| *Dukes, Henry Hugh, St. George, | *South Carolina* |
| *Durrell, Laurence Wood, Ames, | Story |
| *Eales, Howard C., Ames, | Story |
| *Eder, Martha L., Ames, | Story |
| **Edgar, Mary, Ames, | Story |
| *Edgerton, Ruth, Manhattan, | *Kansas* |
| *Edwards, Lucena Mae, Nevada, | Iowa |
| *Edwards, Reba, Ames, | Story |
| *Egger, Myra, Lamar, | *Missouri* |
| Elke, Lillian, Algona, | Kossuth |
| *Eilers, Ella, Fort Dodge, | Webster |
| *Eilers, Neva, Fort Dodge, | Webster |
| *Ellis, Margaret, La Monte, | *Missouri* |
| *Ender, Lurton Roscoe, Des Moines, | Polk |
| *Evans, Edward B., Kansas City, | *Missouri* |
| **Evans, N. W., Columbus, | *Ohio* |
| *Evans, Roger W., Linn Grove, | Clay |
| *Farnum, Fay, Ames, | Story |
| *Farnum, Martha, Ames, | Story |
| *Fearing, R. B., Fort Dodge, | Webster |
| **Fell, Alice T., Everly, | Clay |
| *Fennell, Edna, Davenport, | Scott |
| *Fincham, Guy B., Ames, | Story |
| *Fisk, V. C., Pecatonica, | *Illinois* |
| *Fitch, Hugh, Logan, | Harrison |
| *Fitch, Naomi, Olive, Ames, | Story |
| *Fitzimmons, Alfred Irving, South English, | Keokuk |

*Fitzimmons, Thomas Lora, Lyon, Clinton
*Fleming, Fern, Lynnville, Jasper
*Flick, Fulton Brooks, Dubuque, Dubuque
*Fogleman, Lura Mae, Washta, Cherokee
*Forbes, Florence, Manning, Carroll
*Forrest, Ida, Mt. Vernon, Linn
*Forest, Marjorie, Coggon, Linn
*Fraker, William H., Adel, Dallas
**Frame, Ethel Frences, Denver, *Colorado*
*Frampton, Ora Leon, Boone, Boone
*Franklin, Marion Edmond, Rodman Palo Alto
*Freed, Kittie, Ames, Story
*Frost, Zida, Sioux City, Woodbury
*Fudge, Maybelle, De Sota, Dallas
*Fulghum, Edith Loraine, Mason City, Cerro Gordo
*Fulkerson, Samuel C., Chariton, Lucas
*Fyler, L. S., Shell Rock, Butler
*Garst Rachel Hartshorn, Des Moines, Polk
Geneser, Alice, Granger, Dallas
Geneser, Loretta, Granger, Dallas
Geneser, Martha C., Granger, Dallas
*George, James P., Streator, *Illinois*
*Ghrist, David, Ames, Story
*Gilliland, R. L., Jefferson, Greene
*Glassburn, Vera Irene, Seymour, Wayne
Gleason, Catherine, Blairsburg, Hamilton
**Glenn, Florence, Ottumwa, Wapello
*Graham, Howard O., Cedar Rapids, Linn
*Graham, Lorraine, Audubon, Audubon
*Grawe, Fred S., Panora, Guthrie
*Green, Harry E., Ames, Story
Greer, Vesta Emily, Ames, Story
*Gregg, Etta, Downey, Cedar
*Gregg, Warren B., Barnes City, Mahaska
*Griggs, Muriel K., Ames, Story
*Grimm, Marcus Allen, Coggon, Linn
*Grimm, Elizabeth, Martelle, Jones
*Gue, Jessie, E., Lime Springs, Howard
**Guthrie, Robert E., Woodward, Dallas
**Guy, Hallie E., Moline, *Illinois*
*Guy, Margarette Naomi, Boone, Boone
*Hadley, Bessie, Ottumwa, Wapello
*Haglund, Robert A., Swea City, Kossuth
*Hall, Carolene A., Beaver Falls, *Pennsylvania*
*Halversen, Wm. Vernal, Spanish Fork, *Utah*
*Hammond, Mary Lilla, Lowry City, *Missouri*
*Hansen, J. Rasmus, Ames, Story
**Hanson, Carl H., Webster City, Hamilton
*Harden, Helen, Beatrice, *Nebraska*
*Harmon, Walter L., Plainfield, Bremer
*Harper, Anna G., Ames, Story
*Harriman, Loretta M., Ames, Story
*Harriman, Walter F., Ames, Story
*Harrington, Anna, Holstein, Ida
*Harris, Flora E., Des Moines, Polk
*Harris, Joyce, Dallas Center, Dallas
*Harvey, Ada, Bedford, Taylor
*Haug, Helen, Ames, Story
*Hawkins, Ivan L., Cascade, Dubuque
*Hedlund, Nels Peter Ellis, Stratford, Hamilton
*Heezen, Charles,, Muscatine, Muscatine
*Heidman, Lena Gertrude, Granger, Polk
*Heidman, Mary Emma, Granger, Polk
*Helm, H. J., Council Bluffs, Pottawattamie
*Henderson, W. H., Ames, Story
*Hervey, Vivian, Des Moines, Polk
*Hewitt, Earl Albon, Ames, Story
**Hewitt, Grace, Ames, Story
*Hillis, Edith, Rockwell, Cerro Gordo
*Hines, W. C. Leonard, Traer, Tama
*Hinselman, Helen, Davenport, Scott
*Hinkhouse, Nell, West Liberty, Muscatine
*Hodson, Rose Elizabeth, Ames, Story
*Hoefle, Forrest L., Newell, Buena Vista
*Hollen, Erma E., Ames, Story
*Hollar, G. Hartman, Sioux City, Woodbury
*Holloway, Mrs. Eleanor, Des Moines, Polk
*Holsinger, Nora E., Ames, Story
**Horner, Robert Messenger, Sterling, *Kansas*
*Horrigan, Carrie A., Brooklyn, Powesheik
*Horrigan, Marian C., Brooklyn, Poweshiek
**Howard, E. Carlotte, Ames, Story
*Hungerford, L. N., Fayette, Fayette
*Hunter, Ethel, Ames, Story
**Hunter, Harvey D., Anamosa, Jones
*Ingersoll, Elizabeth, Ames, Story
*Irwin, Harold S., Ireton, Sioux
*Jackson, H. R., Arlington, *Kentucky*
*Jacobs, Pauline, Ft. Madison, Lee
*Jacobson, Lydia, Estherville, Emmet
*Jacobson, Mildred, Boone, Boone
**Jappe, Karl H., Davenport, Scott
*Jaqua, Albert R., Ames, Story
**Jarvis, J. F., Ames, Story
*Jessup, John A., Winfield, Henry
**Johns, Grace Darling Ellen, Iowa Falls, Hardin
*Johnson, D. K., Ames, Story
*Johnson, Eunice E., Boone, Boone
Johnson, Grace, Story City, Story
*Johnson, Myrtle, Stratford, Hamilton
*Jones, Fay, Boone, Boone
*Jones, Guy S., Tabor, Fremont
Jordan, Dixie, Ames, Story
*Kalsem, Madeline Huxley, Story
*Kane, Helen D., Des Moines, Polk
*Kays, F. J., Harlan, Shelby
Keuner, Charlotte, Chelsea, Iowa
*Kennes, Mabel E., Chelsea, Iowa
**Keppel, George C., Keokuk, Lee
**Kern, Florence, Ames, Story
**Killian, Margaret, Kearney, *Nebraska*
King, Aimee, West Point, Lee
**King, Raena, Grundy Center, Grundy
**Kirby, R. S., Mesilla Park, *New Mexico*
*Kirchoff, Lewis C., Dyersville, Dubuque
*Kling, Carolyn, Vinton, Benton
*Koehnle, Yvonne, Lincoln, *Illinois*
*Kremenak, Chas. R., Toledo, Tama
*Kullmer, Albert Lee, Maquoketa, Jackson
Laham, Sophie Dorothea, Wheatland, Iowa
*Lamb, Mrs. A. R., Ames, Story
**Lancelot, W. H., Ames, Story
**Lande, Marie H., Slater, Story
*Lang, Lucille E., Grinnell, Powesheik
*Lantz, Harry L , Ames, Story
Lantz, Mrs. Nellie Mathilde, Huxley, Story
*Larson, Bessie C. H., Rembrandt, Buena Vista
*Lawalin, F. E., Manilla, Crawford
*Laybourne, R. L., Crystal Springs, *Florida*
*Leahy, James W., Council Bluffs, Pottawattamie
*Lee, Merna, Ames, Story
*Linden, Gabriel Eric, Des Moines, Polk
*Linquist, Robert E., Keokuk, Lee
*Linstrand, Gladys Carletta, Madrid, Boone
*Littlefield, Nellie, Exira, Audubon
*Lloyd-Jones, Mrs. Lucy, Ames, Story
*Long, James Dewey, Ames, Story
*Loughran, Ella G., Ames, Story
*Lowe, John, Woodburn, Clarke
**Lowe, Jessie O., Lincoln, *Nebraska*
*Lucado, Mabel L., Fairfield, *Nebraska*
*Luellen, Gladys, Minburn, Dallas
*Lynch, Clara B , Stratford, Hamilton
**Lyon, Arthur L., Unionville, Appanoose
*Lytle, John H , Luther, Boone
*McCabe, Mae Anna, Onaga, *Kansas*
*McCarroll, Carita, Ames, Story
*McCarroll, John H., Ames, Story
**McCarroll, Mary Morrow, Ames, Story
*McCarty, Mayme, Graettinger, Palo Alto
*McClure, Julia E., Rockwell City, Calhoun
*McCook, A. R., Shell Rock, Butler

*McDowell, Rhea, Ames, Story
**McElyea, Sarah, Ames, Story
*McGhee, Harold Green, Council Bluffs, Pottawattamie
*McGregor, Olive Mae, Rippey, Greene
*McGuire, Harry, Clearfield, Taylor
McHugh, Mary Anna, Jefferson, Greene
*McIntosh, Ruth, Manchester, Delaware
*McKay, Anna Belle, Ames, Story
**McLaughlin, Margaret B., Ogden, Boone
*McNeill, Bertha, Epworth, Dubuque
*Maakestad, Emily B., Randall, Hamilton
*Maakestad, W. T., Randall, Hamilton
*MacDonald, John R., Ames, Story
*Mackie, Muriel G., Ames, Story
Macy, C. S., New Providence, Hardin
*Madson, Luella E., Ames, Story
**Melick, Madge, Ames, Story
*Mahan, Paul Palmer, Des Moines, Polk
*Main, Edna, Albion, *Nebraska*
Manning, Marie, Newton, Jasper
*Marshall, Nellie, Guttenberg, Clayton
Martin, Herman Amos, Woodburn, Clark
*Mason, Edda, Iowa Falls, Hardin
*Masters, Kathryn P., Maxwell, Story
Mathewson, Guy, Chariton, Lucas
Mathson, Elise, Bancroft, Kossuth
Mathewson, Ethel Myrl, Chariton, Lucas
*Mead, Lucy, Oakland, *California*
*Mervine, Mrs. E. M., Ames, Story
*Milburn, Irene, Stratford, Hamilton
*Miller, Ada E., Bassett, Chickasaw
**Miller, Cap Earl, Ames, Story
Miller, Theona May, Metz, Jasper
*Minton, Joseph Weber, Logan, Harrison
*Molsberry, W. Winifred, Plymouth, Cerrro Gordo
*Monson, Julia M., Elmore, *Minnesota*
*Moore, Lucinda Violet, Mystic, Appanoose
Moore, Mabel, Mystic, Appanoose
*Moore, Walter L., Ames, Story
*More, Mrs. Sue B., Ames, Story
**Morgan, Mack, Stanford, *Kentucky*
*Morgan, Max, Marshalltown, Marshall
*Morris, Mina, Corning, Adams
*Morrison, E., Kellogg, Jasper
*Moss, Marion A., Los Angeles, *California*
**Mousel, Esther, Bancroft, Kossuth
Mullin, Bernice A., Blairsburg, Hamilton
*Munn, Grace A., Ames, Story
*Munn, Hiram Axtell, Ames, Story
*Murphy, Frederick Douglas, Bloomfield, Davis
*Murphy, Seymour C., Sioux City, Woodbury
*Murray, Edith, Ankeny, Polk
*Myers, John, Ames, Story
*Myers, Mrs. Maude, Ames, Story
**Myers, Vera, Oklahoma, *Oklahoma*
*Nagel, G. Paul, Lime Springs, Howard
*Napper, Harry E., Ames, Story
*Nathan, Minnie, Boone, Boone
**Naven, Benjamin Stanton, Waterloo Black Hawk
*Naylor, Esther, Stratford, Hamilton
*Naylor, Nellie M., Ames, Story
*Neel, Lydia H., Greensburg, *Pennsylvania*
*Nelson, Bessie O., Ames, Story
*Ness, Zenobia Brumbaugh, Ames, Story
*Nichols, Mrs. Annie, Ames, Story
*Niles, Laura, Ames, Story
*Noble, Margaret, Ames, Story
*Noble, Nellie, Ames, Story
*Norman, Melvin E., Logan, Harrison
*Norton, Carolyn, Newell, Buena Vista
*Novak, L. V., Cedar Rapids, Linn
*Novak, Mrs. L. V., Cedar Rapids, Linn
*Niles, G. W., Ames, Story
*Nutt, Hubert Estel, College Springs, Page
**Olsen, John T., Ames, Story
*Olson, Edith, I., Eagle Grove, Wright
*Orr, H. W., Mason City, Cerro Gordo
*Orr, James, Waukon, Allamakee
*Osgood, Albert S., Ft. Dodge, Webster
*Overmyer, Ray M., Lindsey, *Ohio*
*Palmer, Donald Graham, Vinton, Benton
*Palmer, Ronald, Emmetsburg, Palo Alto
*Parker, Dora Hall, Ida Grove, Ida
*Parker, Eve., Sigourney, Keokuk
*Perkins, Charles Willard, Woodbine, Harrison
*Parks, G. C., Muscatine, Muscatine
*Parlier, Cornelia Alta, Smithland, Woodbury
*Parlier, Leila Ardath, Smithland, Woodbury
*Peddie, William Dick, Emmetsburg, Palo Alto
*Perkins, Juanita, Eldor, Hardin
*Perry, Glenn Ralph, Charter Oak, Crawford
**Perry, Winifred, Ames, Story
*Peters, Mercedes, Burt, Kossuth
Peters, Ella K., Hamlin, Audubon
Petersmith, Antoinette, West Point, Lee
*Phillips, Agnes, Colfax, Jasper
*Phillips, Roxy, Seymour, Wayne
*Pickford, Rollo S., Nora Springs, Cerro Gordo
*Pim, Raymond T., Lucas, Lucas
**Pond, Lee Wah, Canton, *China*
*Poshusta, D.C., Mason City, Cerro Gordo
**Pottle, Arthur Francis, Grinnell Poweshcik
*Powell, Raymond L., Walker, Linn
*Potts, Mildred, Ames, Story
*Preston, Lorene, Des Mionos, Polk
*Pritchett, Louise, Ames, Story
*Raymond, Helen, Ames, Story
*Raymond, Winifred, Ames, Story
**Redditt, John R., Ames, Story
*Reed, F. P., Osceola, Clarke
*Rees, Marie Theresa, Logansport, *Indiana*
*Rehmann, T. W., Des Moines, Polk
*Reins, Ina L., Ames, Story
*Remer, Gladyse, Urbana, Benton
**Rhoads, Edna M., Ames, Story
**Rhoads, Zelda, Ames, Story
*Rhodes, Ida, Otho, Webster
Rich, Venita, Chelsea, Tama
*Richardson, Samuel A., Ames, Story
**Ricketts, Gladys M., Ames, Story
*Riep, John Held, Burlington, Des Moines
*Rinehart, Lillian, Ames, Story
Ringgenberg, Carl Herman, Ames, Story
*Risser, John Ray, Des Moines, Polk
*Roach, Lloyd E., Tama, Tama
*Robbins, B. L., Pella, Marion
*Roberts, Elizabeth Mary, Batavia, Wapello
Robinson, Joe L., Omega, *Oklahoma*
**Robinson, Rebecca, Masonville, Delaware
Rogers, Myrtle Viola, Muscatine, Muscatine
*Rule, Louise Ellen, Boone, Boone
**Russell, W. H., Douds Leando, Van Buren
*Sadler, Stella Viola, Rockwell, Cerro Gordo
*Sage, James R., Ames, Story
*Sage, Mrs. James R., Ames, Story
*Samonte, Lorenzo, Lavag, Ilocо Norte, *Philippine Islands*
*Sand, Stanley, Eau Galle, *Wisconsin*
*Sandell, Orlando, Stratford, Hamilton
**Sather, A. A., Menomonie, *Wisconsin*
*Saunders, Dudley Dunn, Memphis, *Tennessee*
*Sawyer, Fred R., Sioux City, Woodbury
**Schnekloth, Hermine C., Davenport, Scott
*Shultz, O. N., Ringsted, Emmet
**Schwanz, Harriet, Lorimor, Union
*Schwartz, Bess C., W. Burlington, Des Moines
*Scoles, D. L., Ames, Story
*Scott, Cora E., Ames, Story
Scott, Florence E, Ames, Story
*Scott, Glenn William, Edgewood, Clayton
*Scott, Winfield, Grantsburg, *Illinois*
*Searle, Albert H., Hawarden, Sioux

*Seaton, Nan, Ames, Story
*Sehr, Minnie, Iowa City, Jackson
Seibert, Edna, Grimes, Polk
*Seidell, Herbert A., Ames, Story
*Shaw, Alfred, Parkston, *South Dakota*
*Shedd, Mrs. C. K., Ames, Story
**Sheets, Willis C., Ames, Story
*Shepard, Lester, Mystic, Appanoose
*Shirbroun, M., Ames, Story
*Shirk, Jay B., Paxton, *Montana*
Shirley, Anna, Minburn, Dallas
*Shoemaker, Leonard, Palmer, Pocahontas
*Shull, Mrs. William, Ames, Story
*Simmons, Margaret Louise, Fairfield Jefferson
**Slayton, Hollis H., Des Moines, Polk
**Sloss, Grace, Ames, Story
*Smiley, Thomas, Grinnell, Powesheik
*Smillie, Gina, Eaton, *Colorado*
**Smith, Aletha, Kilbourne, Van Buren
*Smith, Eloise Blair, Fairfield, Jefferson
*Smith, E. S., Ames, Story
*Smith, Eden W., Essex, Page
*Smith, Fay B., Des Moines, Polk
*Smith, Mrs. Libbie A., Ames, Story
Smith, Mary, Blakesburg, Wapello
**Smith, Robert E., Ames, Story
*Smith, Rose Rummel, Ames, Story
*Smith, Thelma M., Ames, Story
*Soppeland, Lulu, Badger, Humboldt
*Sorenson, Mrs. C., Ames, Story
*Southwick, Myrtle M., Oskaloosa, Mahaska
*Spire, Hazel Fay, Tama, Tama
*Spring, Thomas Garfield, Epworth, Dubuque
*Spring, Mrs. Thomas G., Epworth, Dubuque
*Stakke, Burnice, Woonsocket, *South Dakota*
**Stallings, James Henry, Bryon, *Texas*
**St. Clair, W. H., Woodbine, Harrison
*Steffey, Mrs. A. J., Ames, Story
*Stephenson, A. R., Ames, Story
*Stevens, Edna Etta, Eagle Grove, Webster
*Stevens, Lois G., Keokuk, Lee
*Stevenson, B. M., Rockwell City, Calhoun
*Stevenson, Mrs. W. H., Ames, Story
*Stewart, Dorothy Anne, Hartley, O'Brien
*Stoll, Lorena Dorothea, Sheffield, Franklin
*Storey, Katie Marie, Ames, Story
*Stouder, Mrs. K. W., Ames, Story
*Snavely, Everett H., Waterloo, Black Hawk
*Suer, Elizabeth, Ellen, Lehigh, Webster
*Sullivan, Everett N., Dolliver, Emmet
**Sutherland, O. C., Warsaw, *Missouri*
*Swearingen, Elnora, Ames, Story
**Swearingen, George E., Ames, Story
*Taft, Ollie, Hudson, *South Dakota*
*Talcott, Frances V., Maynard, Fayette
*Tallman, Elmer Willett, Mt Vernon, Linn
*Tavrea, Verna, Boone, Boone
**Taylor, Flossie, Jefferson, Greene
*Taylor, Kathryn Louise, Independence, Buchanan
*Taylor, Lawrence James, Laurens, Pocahontas
*Taylor, Marion, Independence, Buchanan
*Templeton, Mrs. Lillian A., Ames, Story
*Tenney, Florence, Montour, Tama
**Thiesen, Laura, Dysart, Tama
*Thomas, Celia M., Red Oak, Montgomery
**Thompson, J. I., Leon, Decatur
*Thornburg, Mary M., Ames, Story
*Thornburg, Lettie, Ames, Story
*Thornton, Ralph Herald, Bartlett, Fremont
*Thorp, Jennie E., Clarinda, Page
*Throckmorton, John Carder, Garden Grove, Decatur
*Tilden, Ina M., Ames, Story
*Tilden, Mrs. Lydia C., Ames, Story
*Tilton, Bessie S., Indianola, Warren
*Tobin, Margaret J., Osage, Mitchell
**Todnem, Anna Carolina, Ames, Story
*Trexel, Helen Emma, Ames, Story
*Trezona, Lee R., Strawberry Point, Clayton
*Troutner, Edith, Charles City, Floyd
*Underwood, Ruth, Grand Junction, Greene
*Valdez, Juan J., Candon, *Philippine Islands*
*Van Buskirk, Earl, Selma, Davis
*Vander Linden, Anna, Murray, Clarke
*Van Horne, Louise M., Syracuse, *Nebraska*
*Vogel, I. H., Ames, Story
*Waldron, Viola Margaret, Dallas Center, Dallas
*Wall, L. A., Alta, Buena Vista
*Walls, Florence, Clinton, Clinton
*Wangeln, Fred G., Boone, Boone
*Waters, Georgetta, Ames, Story
*Welch, Jessie L., Boone, Boone
*Welsh, Frank E., Garner, Hancock
*Warren, Harold F., Indianola, Warren
*Wasser, Myra, Ames, Story
*Watts, Enid, Mason City, Cerro Gordo
*Wells, Ned E, Marathon, Buena Vista
**Welsh, Kathryn Clare, Bradford, *Illinois*
*Wenks, B. Irman, Davenport, Scott
*West, Juanita Grace, Boone, Boone
Whitehouse, Irene May, Granger, Polk
*Whitman, Helen, Yale, Guthrie
*Whitman, John R., Yale, Guthrie
*Whitney, Gaynell, Marshalltown, Marshall
*Whitson, Jay, Neola, Pottawattamie
*Wiedeman, Louise Vio., Burlington, Des Moines
*Wilkinson, Leona, Chelsea, Tama
*Wilkinson, Mrs. J. A, Ames, Story
*Willard, Arthur M., Sioux Rapids, Clay
*Willging, Harold M., Ogden, Boone
*Williams, Charles Byron, Ames, Story
*Williams, Clyde, Ames, Story
*Wilson, Cora I., Hedrick, Keokuk
*Wilson, Doris, Ames, Story
Wilson, Edith A., Corwith, Hancock
*Wineinger, John, Dunlap, Harrison
*Winslow, Mrs. N G. N., Ames, Story
*Woestman, Reynold A., Dyersville, Dubuque
*Wohlenberg, Alice, Everly, Clay
*Wolrab, Milo, Cedar Rapids, Linn
*Wood, A. A., Laurens, Pocahontas
*Wood, Louise, Iowa Falls, Hardin
*Woodburn, Mark V., Memphis, *Tennessee*
*Woods, Florence H., Ames, Story
*Wortman, Ruth, Ames, Story
*Wright, Clifford L., New Hartford, Butler
*Wright, Thelma, Logan, Harrison
*Wylie, Josephine, Boone, Boone
*Yeager, W. R., Fairfield, Jefferson
*Young, Edith M., Garden Grove, Decatur

## SECOND SUMMER SESSION, 1917

| *Name and Town* | *County* |
|---|---|
| *Adams, Chester Shaff, Clinton, | Clinton |
| Anderson, Mabel, Cedar Falls, | Black Hawk |
| Anderson, Nellie, Boone, | Boone |
| *Archer, Gladys, Red Oak, | Montgomery |
| *Bonner, Gladys, Jewell, | Hamilton |
| *Brann, Edna, Leon, | Decatur |
| *Browning, Glenn H., Mt. Vernon, | Linn |
| *Burge, Chas. A., Mt. Vernon, | Linn |
| *Burns, Martha, Ames, | Story |
| *Cahill, Edward John, Peru, | Madison |
| *Carlsen, Elise, St. Ansgar, | Mitchell |
| *Carter, Edith, Ames, | Story |
| *Castle, Lynn E., Correctionville, | Woodbury |
| *Cherry, Ernest Joseph, Walker, | Linn |
| *Christy, Harry W., Bloomfield, | Davis |
| *Clark, Clarissa, Ames, | Story |

*Cooney, Ida G., Everly, Clay
*Cory, Faye, Altoona, Polk
*Crouse, F. E., Floyd, Floyd
*Cutler, Mae, Cedar Rapids, Linn
*Davis, D. A., Ames, Story
*Davis, Merl E., Derby, Lucas
*Dean, Grace M., Ames, Story
*Dolvin, J. V., Ames, Story
*Edgar, Mary, Ames, Story
*Edwards, Samuel, Jr., Dubuque, Dubuque
*Evans, N. W., Columbus, *Ohio*
*Fell, Alice T., Everly, Clay
*Finch, Pearl, Northwood, Worth
Frame, Ethel, Denver, *Colorado*
*Glenn, Florence, Ottumwa, Wapello
*Grove, Paul M., South English, Keokuk
*Guernsey, La Mar, Marshalltown, Marshall
*Guiles, Spencer, A., Boxholm, Boone
*Guthrie, Robert E., Woodward, Dallas
*Guy, Hallie E., Moline, *Illinois*
Hammond, Dorothy D., Lowry City, *Missouri*
*Hanson, Carl H., Webster City, Hamilton
*Heezen, Charles C., Muscatine, Muscatine
Hewitt, Grace, Ames, Story
*Hines, Adah A., Traer, Tama
*Horner, Robert Messenger, Sterling, *Kansas*
*Howard, E. Carlotta, Ames, Story
*Hoyer, Laurence Edward, Ames, Story
*Hunter, Harvey D., Anamosa, Jones
*Jappe, K. H., Davenport, Scott
*Jarvis, J. F., Marshalltown, Marshall
*Johns, Grace, Iowa Falls, Hardin
*Jones, Wm. Conrad, Van Meter, Dallas
*Keppel, George Charles, Keokuk, Lee
*Kern, Florence, Ames, Story
*Killian, Margaret, Kearney, *Nebraska*
*King, Ernest Edgar, Ames, Story
*King, Raena, Grundy Center, Grundy
*Kirby, Robert Stearns, Mesilla Park, *New Mexico*
*Krebs, Leland P., Cedar Rapids, Linn
*Kreiner, Ralph Herman, Hansell, Franklin
*Lancelot, W. H., Ames, Story
Lande, Marie H., Slater, Story
*Lister, Carol, Conrad, Grundy
*Lowe, Jessie O., Lincoln, *Nebraska*
*Lusted, George Charles, Dysart, Tama
*Lyon, Arthur L., Unionville, Appanoose
*McCarroll, Mary Morrow, Ames, Story
*McElyea, Sarah, Ames, Story
*McFann, Cynthia, Cedar Rapids, Linn
*McLaughlin, Margaret, Ogden, Boone
*Melick, Madge, Ames, Story
*Miller, Cap Earl, Ames, Story
*Moore, Lucinda Violet, Mystic, Appanoose
*Morgan, Mack, Stanford, *Kentucky*
*Mousel, Esther, Bancroft, Kossuth
*Myers, Vera, Oklahoma, *Oklahoma*
*Naven, Ben, Waterloo, Black Hawk
*Nicolle, Marie, Des Moines, Polk
*Olsen, John T., Ames, Story
Perry, Winifred, Ames, Story
*Pond, Lee Wah, Canton, *China*
*Pottle, Arthur L., Grinnell, Poweshiek
*Redditt, John, Ames, Story
*Reeves, Kenneth, Waverly, Bremer
*Rhoads, Edna M., Ames, Story
*Rhoads, Zelda, Ames, Story
*Ricketts, Gladys M., Ames, Story
*Robinson, Joe L., Omega, *Oklahoma*
*Roudabush, Wm. J., Brooklyn, Poweshiek
*Russell, W. H., Douds Leando, Van Buren
*Sather, Arnold, Menomonie, *Wisconsin*
*Shallenberger L. B., Long Pine, *Nebraska*
*Schnekloth, Hermine C., Davenport, Scott
*Schwanz, Harriett, Lorimor, Union
*Seaton, Elma, Ames, Story
*Seaton, Ruth Ernestine, Ames, Story
*Sexauer, Theodore, Ames, Story
*Sheets, Willis C., Ames, Story
*Slayton, Hollis H., Des Moines, Polk
*Sloss, Grace, Ames, Story
*Smith, Aletha, Kilbourne, Van Buren
*Smith, Etta May, Gillet Grove, Clay
*Smith, Robt. E., Ames, Story
*Stallings, James Henry, Ames, Story
*St. Claire, W. H., Woodbine, Harrison
*Stephenson, Earl R., Dayton, Webster
*Stewart, Margaret, Davenport, Scott
*Sutherland, O. C., Warsaw, *Missouri*
*Swearingen, Geo. E., Ames, Story
*Taylor, Flossie, Jefferson, Greene
*Te Winkel, J. M., Ames, Story
*Thiesen, Laura, Ames, Story
*Thiesen, Margaret, Ames, Story
*Thompson, J. I., Leon, Decatur
*Todnem, Anna Carolina, Ames, Story
*Welsh, Kathryn Clare, Bradford, *Illinois*
*Winter, Daniel, Middletown, Des Moines
*Young, Chas. A., Barnes City, Mahaska
*Zentmire, Judson H., Ames, Story

# WINTER SHORT COURSE

## In Agriculture

*Regular College students.

**Students enrolled in more than one course.

| *Name and Town* | *County* |
|---|---|
| Abkers, Theo., Austinville, | Hardin |
| Acrola, C. T., Ames, | Story |
| Adair, S. R., Redding, | Ringgold |
| Ady, A. H., Marengo, | Iowa |
| Ady, Robert, Thurman, | Fremont |
| Aiton, A. T., Bedford, | Taylor |
| Alberts, Lester, Alton, | Hardin |
| Albers, M. Z., Grimes, | Polk |
| Alderman, Roscoe, Little Rock, | *Arkansas* |
| Alexander, Arthur, Eagle Grove, | Wright |
| Alexander, Millard, Indianola | Warren |
| Alkee, G. M., Newell, | Buena Vista |
| Allen, B. S., Pocahontas, | Pocahontas |
| Allen, Clarence, Tiffin, | Johnson |
| Allen, C. V., Indianola, | Warren |
| Allen, Earl T., Lucas, | Lucas |
| Allen, Wayne, Tiffin, | Johnson |
| Allison, J. E., Butler, | *Missouri* |
| Amundson, Justin, Milford, | Dickinson |
| Anderson, C. W., Madrid, | Boone |
| Anderson, E. J., Story City, | Hamilton |
| Anderson, F. O., Harcourt, | Webster |
| Anderson, Floyd, Boxholm, | Boone |
| Anderson, Geo., Inwood, | Lyon |
| Anderson, Glenn, Sumner, | Bremer |
| Anderson, Gus, Stratford, | Hamilton |
| Anderson, Leland, Vinton, | Kossuth |
| Anderson, H. A., Cedar Falls, | Grundy |
| Anderson, Harvey, Milford, | Dickinson |
| Anderson, John, Royal, | Clay |
| Anderson, John, Story City, | Story |
| Andrews, L. J., Des Moines, | Polk |
| Andrews, Rudy, Stratford, | Hamilton |
| Angstrum, Andrew, Stratford, | Hamilton |
| Anfinson, Thomas, Huxley, | Story |
| Anthony, C. H., Des Moines, | Polk |
| Anthony, R. C., Tiffin, | Johnson |
| Apland, Peter Cambridge, | Story |
| **Arend, Marcus, Fenton, | Kossuth |
| Armstrong, A. A., Stratford, | Hamilton |
| Armstrong, John, Ames, | Story |
| Ash, Bert, Spirit Lake, | Dickinson |
| Atkinson, Burr, Clemons, | Marshall |
| Augastin, H., Orient, | Adair |
| **Averhoff, Geo., Waterloo, | Black Hawk |
| Badger, L. J., Adel, | Dallas |
| Bahnson, A. H., Inwood, | Lyon |
| Bailey, E. J., Ida Grove, | Ida |
| Bailey, M. B., Dunlap, | Harrison |
| Baird, A. C., Redding, | Ringgold |
| Bairrier, J. E., Mitchelville, | Polk |
| Bakely, Linda, Boxholm, | Boone |
| Baker, C. W., Woolf, | *Wyoming* |
| Baker, Johnny, Cooper, | Green |
| Baker, W. N., Rudd, | Floyd |
| Bakkum, G. A., Halfa | Emmet |
| Baldwin, Clarence, Newton, | Jasper |
| Balhler, C. N., Worthington, | Dubuque |
| Balkema, N., Johnston, | Polk |
| Bane, C. A., Bondurant, | Polk |
| Bane, J. G., Oakland, | Pottawattamie |
| Bannhover, A. H., Carroll, | Carroll |
| Barber, G. S., Ames, | Story |
| Bare, M. J., Walker, | Buchanan |
| Barstead, Sioux Rapids, | Buena Vista |
| Bartley, C. M., Laurens, | Pocahontas |
| Bass, J. H., Waukee, | Dallas |
| Bass, W. M., Boone, | Boone |
| Battles, Finley, Mingo, | Jasper |
| Bauck, Wayne, Mason City, | Cerro Gordo |
| Bauge, Delbert, Dows, | Wright |
| Baxter, C. J., Ft. Madison, | Lee |
| Beall, Roy, Oelwein, | Fayette |
| Beeghly, M., Kingsley, | Woodbury |
| Beeghly, E., Kingsley, | Woodbury |
| Beeler, O. W., Boone, | Boone |
| Bell, A. D., Story City, | Story |
| Bender, D., Hinton, | Plymouth |
| Bengson, R. F., Ogden, | Boone |
| Benner, Paul, Rhodes, | Marshall |
| Bennett, Rev. Geo., Iowa City, | Johnson |
| Bennett, Ray F., Ames, | Story |
| Benson, A. D., Thurman, | Fremont |
| Benson, H. D., Thurman, | Fremont |
| Benson, Lois C., Aurelia, | Cherokee |
| Benson, Paul, Shenandoah, | Page |
| Benz, Fred, Fredericksburg, | Chickasaw |
| Berg, Jennings, Boyer, | Crawford |
| Bergendahl, P. E., Pilot Mound, | Boone |
| Berkland, Henry, Nevada, | Story |
| **Berry, W. J., Mason City, | Cerro Gordo |
| Best, Glenn, Shelby, | Shelby |
| Biglow, W. I., Salix, | Woodbury |
| Binger, K. R., Charles City, | Floyd |
| Bird, Orner, Ellsworth, | Hamilton |
| Birkeland, Henry, Nevada, | Story |
| Bishop, Lou, Rudd, | Floyd |
| **Bishop, Merit, Rudd, | Floyd |
| Bitting, J A., Des Moines, | Polk |
| Bjorland, C., Albert City | Pocahontas |
| Bjustrom, Bennie, Stratford, | Hamilton |
| Black, Orville, Osceola, | Clark |
| Blaine, Glenn, Bertram, | Linn |
| Blake, E., Rhodes, | Marshall |
| Blanch, Geo., Cherokee, | Cherokee |
| Blaser, H. L., Milan, | *Illinois* |
| Blewett, H. B., Meservey, | Cerro Gordo |
| Bloomquist, Arvid, Boxholm, | Boone |
| Bloomquist, Ernest, Boxholm, | Boone |
| Bloser, J. H., Milan, | *Illinois* |
| Blunt, Chester, Milford, | Dickinson |
| Blythe, John, Williamsburg, | Iowa |
| Bodenhafer, John, Mechanicsville, | Cedar |
| Boeck, O. C., Dennison, | Crawford |
| Bolanz, Fred, Oskaloosa, | Mahaska |
| Bolen, V. B., Brooklyn, | Poweshiek |
| Bolte, A. C., Maquoketa, | Jackson |
| Bolton, Carl M., Macedonia, | Pottawattamie |
| Borgenson, Roy, Glidden, | Carroll |
| Boven, D. H., Grundy Center, | Grundy |
| Boyland, Floyd, Manchester, | Delaware |
| Bradbury, J. C., Atlantic, | Cass |
| Brader, L. E., Des Moines, | Polk |
| Bradford, L. A., Ames, | Story |
| Bradley, R. J., Armstrong, | Emmet |
| Brady, A. V., Sanborn, | O'Brien |

Brame, J. E., Independence, Buchanan
Brandt, Herbert C., Waverly, Bremer
Brant, W. O., Glencoe, *Minnesota*
Brewer, Harold, Woodbine, Harrison
Brewster, G. H., Springfield, Greene Co., *Missouri*
Bridges, A. J., Bedford, Taylor
Bridges, Chas., Searsboro, Poweshiek
Bridson, Emmet, Spirit Lake, Dickinson
Brock, C. M., Indianola, Warren
Broderson, Laurens, Pocahontas
Bronson, Walter, Fenton, Kossuth
Brooks, Geo., Whiting, Monona
Brooks, Steven, Ames, Story
Brown, Arthur, Mitchelville, Polk
Brown, Arthur, Kelly, Story
Brown, Elmer M., Ames, Story
Brown, J. A., Ames, Story
Brown, Robert, Rockford, Floyd
Brown, Scott A., Ruckneyville, *Illinois*
Brownell, F. N., Sac City, Sac
Brownlee, T. C., Sheridan, Lucas
Brownson, H. C. McGregor, Clayton
Bruce, A. J., Des Moines, Polk
Bruggeman, Cecil, Waterloo, Black Hawk
Bruner, Ruben, Sac City, Sac
Bruns, A. R., Sigourney, Keokuk
**Buchanan, W. A., Marshalltown, Marshall
Buck, G., Rhodes, Marshall
Buck, John, Mt. Ayr, Ringgold
Buck, Ralph, Rhodes, Marshall
Buck, W. B., Mt. Ayr, Ringgold
Buckmeyer, Henry, Tama, Tama
Bull, Will, Ackley, Hardin
**Bunch, Clifford, Laurens, Pocahontas
Buoy, J. W., Corydon, Wayne
Burdette, Bell, Clarion, Wright
Burford, T. V., Des Moines, Polk
Burger, A. A., Cedar Falls, Black Hawk
Burger, R. H, Van Meter, Dallas
Burgy, J. H., South Amana, Iowa
Burk, Chas., Waterloo, Black Hawk
Burk, C. H., Waterloo, Black Hawk
**Burk, Ralph, Waterloo, Black Hawk
Burns, C. D., Marion, Linn
**Burns, John, Charles City, Floyd
Burns, W. G., Des Moines, Polk
Burr, Ted, Storm Lake, Buena Vista
Burton, Effie M., Cedar Rapids, Linn
Butler, Arthur, Northwood, Worth
Butler, H. W., Rhodes, Jasper
Butterworth, Earl R., Ft. Dodge, Webster
**Buwalda, John, Pella, Marion
Bye, E. J., West Branch, Cedar
**Byers, Lawrence, Spirit Lake, Dickinson
Cakerice, R. H., Marshalltown, Marshall
Callen, Walter, Centerville, Appanoose
Campbell, Rev. T. F., Liberty Bell, Jefferson
Campbell, Glenn, Marathon, Buena Vista
Carlson, H. E., Boone, Boone
Carlson, Phillip, Boxholm, Boone
Carpenter, Leonard, Oskaloosa, Mahaska
**Carpenter, O. S., Iowa Falls, Hardin
Carr, Fred, Strawberry Point, Clayton
**Carrick, Beryl, Bagley, Guthrie
**Carrick, Harold, Bagley, Guthrie
Carson, E. C., Woodburn, Clarke
Carter, J. H., Waukee, Dallas
Carter, L. V., Lawn Hill, Hardin
Carver, T. J, Collins, Jasper
Casey, J. E., Lenox, Taylor
**Chalstrom, Harold, Spirit Lake Dickinson
Chantland, I. A., Ft. Dodge, Webster
Charleston, J., Radcliffe, Ida
Chase, R. M., Tipton, Cedar
Chatfield, G. W., Waterloo, Black Hawk
Childs, Dale, Masonville, Delaware
Childs, C. I., Waukon, Allamakee
Childs, Walter, Masonville, Delaware
Chingren, Frank, Boxholm, Boone
Chingren, Oliver, Boxholm, Boone
Chingren, Elmer, Boxholm, Boone
Christensen, Alfred, Hudson, Black Hawk
Christensen, Andrew, New Hartford, Butler
Christian, J. S., Nevada, Story
Christiansen, L. J. M., Gilmore City, Pocahontas
Christy, Morris W., Ottumwa, Wapello
Churchill, E. P., Allerton, Wayne
Civell, Harold, Welton, Muscatine
Clampitt, R. R., New Providence, Hardin
Clark, H., Riceville, Mitchell
Clark, B. F., Shannon City, Union
Clark, J. T., Ames, Story
Clark, M. J., Ames, Story
Clark, M. L., Clarion, Wright
Clark, M. G., Hartford, *South Dakota*
Clause, Edgar, Verdin, *Illinois*
**Clayton, Donald, Waukee, Dallas
Clemons, A. C., N. Buena Vista, Dubuque
Clubb, C. L., Des Moines, Polk
Coffey, L., Humeston, Wayne
Coffey, L. T., Humeston, Wayne
Coffin, V. H., Bradgate, Humboldt
Coleman, R. W., Nora Springs, Floyd
Collins, Fay, Thomasville, *Illinois*
*Colville, E. D., Oskaloosa, Mahaska
Comdra, J. N., Seymour, Wayne
Conklin, D., Muscatine, Muscatine
Conklin, Ronald, Muscatine, Muscatine
Conrad, Henry S., Grinnell, Poweshiek
Cook, Arold, Terrill, Dickinson
**Cook, O. A., Dow City, Crawford
**Coon, Maxine, Charles City, Floyd
Corcoran, E. J., Fairbank, Buchanan
**Corkery, Richard, Wadena, Fayette
Cornell, R. J., Des Moines, Polk
Corwin, H. M., Rock Valley, Sioux
Coughlan, Vernon, Mingo, Jasper
Covert, W. C., Chicago, *Illinois*
Converse, C. C., Maxwell, Marion
Cox, S. C., Indianola, Warren
**Coye, Raymond, Council Bluffs, Pottawattamie
Coyne, P. J., Anthon, Woodbury
Cramer, E. F., Newton, Jasper
Cress, Harold, Riverside, Johnson
Crim, Floyd, Stratford, Webster
Criswell, W. J., Logan, Harrison
Criswell, H. C., Des Moines, Polk
Crosby, Geo., Spirit Lake, Dickinson
Crouch, Robert, Boxholm, Boone
Crouse, F. H., Dike, Grundy
Crouthmel, Lee, Boone, Boone
**Crow, Lloyd, Oxford, Johnson
Crow, Morris, Mingo, Jasper
**Crow, Raymond, Oxford, Johnson
Cummins, E. H., Storm Lake, Buena Vista
Cumpston, H. H., Sheridan, Lucas
Curly, J. E., Rockwell, Cerro Gordo
Currans, Edwin, Ruthven, Palo Alto
Cutler, Clark, Corydon, Wayne
Dales, Vincent, Colfax, Jasper
Dana, D. C., Monona, Clayton
Daniels, M. R., Pulaski, Davis
Dams, F. A., Clemons, Marshall
Daum, Paul, Filer, *Idaho*
Davenport, P. A., Swea City, Kossuth
Davidson, D., Northwood, Worth
Davis, Edwin W., Avoca, Pottawattamie
Davis, Harold P., Des Moines, Polk
Davis, R. V., Clemons, Marshall
Davisson, Gilbert, Mason City, Cerro Gordo
Dawson, C. V., Kennedy, Dallas
Dawson, O. A., Bagley, Guthrie
Dawson, W. H., Bagley, Guthrie
Day, Raymond, Cooper, Greene
**Deahl, E. E., Centerville, Appanoose

Dean, A. H., Ames, Story
Dean, H., Sloan, Woodbury
Dean, H. C., Sanborn, O'Brien
Dean, W .M., Ocheydan, Osceola
De Carnys, L. O., Waterloo, Black Hawk
Dee, John, Brooklyn, Poweshiek
Dennan, Benson, Macksbury, Madison
DeMar, Henry, Sulphur Springs, Buena Vista
DeMar, H. J., Sulphur Springs, Buena Vista
De Neui, Abe., Wellsburg, Grundy
Denton, George, Durant, Cedar
Deppe, Clark, Nemaha, Sac
Derickson, C. V., Redding, Ringgold
Detlefsen, Frank, Central, Linn
Detlefsen, Frank, Coggon, Linn
De Valois, John, Boyden, Sioux
De Valois, Edgar, Boyden, Sioux
Dewey, C. H., Murray, Clark
Dewey, T. H., Janesville, Bremer
Dewey, W. X., Milford, Dickinson
Diehl, Russell, Boone, Boone
Dineson, A. A., Harlan, Allen
Dinnes, O. S., Eldora, Hardin
Dirst, Harold, Hampton, Hardin
Doane, C. S., Newton, Jasper
Dofler, F. W., Charter Oak, Crawford
Dorance, Howard, Keota, Keokuk
Dorance, W. H., Keota, Keokuk
Dorse, Donald, Janesville, Bremer
Dorsey, Harold, Mars, Madison, Co., *Illinois*
Dorsey, Samuel, Mars, *Illinois*
Downey, Owen, Lacey, Mahaska
Downs, C. M., Oskaloosa, Mahaska
Down, Vernon, Odebolt, Sac
Dowson, C. V., Kennedy, Dallas
Drake, Alfred, Winterset, Madison
Driswell, Vincent, Waterloo, Black Hawk
Duben, George, Cromwell, Adams
**Duroe, Wm., Sioux Rapids, Buena Vista
Durst, H. M., Hampton, Franklin
Dvoak, Frank, Elbern, Tama
Dwyer, Austin, Ayrshire, Palo Alto
Dykstra, C. P., Pella, Marion
East, Marvin, Stanhope, Hamilton
Edgars, Crim, Stratford, Webster
Edmonson, E. V., Orient, Adair
Edson, Harold, Nashua, Chickasaw
Edwards, Lloyd, Jefferson, Greene
Edwards, R. M., Des Moines, Polk
Eichelberger, Milton, Muscatine Muscatine
**Eldredge, J. C., Estherville, Emmet
Ellis, J. S., Kellerton, Ringgold
Elsbor, W. M., Ames, Story
**Emmons, Allan, Robins, Linn
Enright, Thos., Patterson, Madison
Ericson, S. A., Story City, Story
Erickson, J. M., Slater, Story
Erickson, Paul, Stanhope, Hamilton
Euken, Carl, Wiota, Cass
Eutz, J. Edward, LaPorte City, Black Hawk
Evans, Eric, Roland, Story
Evans, Geo. W., Ottumwa, Wapello
Evans, Lewis, Roland, Story
Evans, Lester, Dickens, Clay
Eveland, H. A., Jamaica, Guthrie
Evenson, H. A., Roland, Story
Everett, Nellie, Clinton, Clinton
Eves, J. P., Waterloo, Black Hawk
Exo, Arnold H., Muscatine, Muscatine
Faas, Byron, Williamsburg, Iowa
Faley, Robert C., Cresco, Howard
Farnum, E., Ames, Story
Farr, E. U.,
Farrington, F. F., Silver City, Mills
Favor, E. H., Galva, *Illinois*
Fee, Howard, Cherokee, Cherokee
Fellows, A. L., Keosauqua, Van Buren
Felter, V., Des Moines, Polk

Fern, W. E., Lloydminster, *Sask., Can.*
Ferris, Earl, Hampton, Franklin
Fierstine, D. P., Manchester, Delaware
Finders, Bert, Ferguson, Marshall
Finders, Ernest, Ferguson, Marshall
Finders, Lee, Ferguson, Marshall
Findley, C. D., Dallas Center, Dallas
Fisher, Fred, Ames, Story
Fisher, Julius, Cleves, Hardin
Flatzess, Edward, Northwood, Worth
Fleck, W. D., Oskaloosa, Mahaska
Fleming, E. E., Gilman, Marshall
Flohrer, M. R., Denmark, Lee
Flugul, C. M., Leland, Winnebago
**Flynn, Leo, Fenton, Kossuth
Folkers, Richard, Ackley, Hardin
Folkers, Roy, Ackley, Hardin
Forkner, E. A., Marshalltown, Marshall
Forney, Malcolm, Osceola, Clark
Forney, Paul, Carson, Pottawattamie
Fosberg, Clarence, Stanhope, Hamilton
Fossell, Walter, Gilbert, Story
Fowle, J. Leonard, Tipton, Cedar
Fowler, E. E., Ames, Story
Fox, C. A., Ontario, Story
Fox, Geo. M., Dallas Center, Dallas
Fox, G. J., Riceville, Howard
Foy, F. E., Redfield, Redfield
Foy, J. F., Redfield, Redfield
Frandsen, J. H., Ames, Story
Frandson, A. B., Story City, Story
Frandson, Wm., Story City, Story
Frederickson, W., Guthrie Center, Guthrie
Fredergill, Earl, Carlisle, Warren
Freed, Leo, Eldora, Hardin
Freel, Ray, Ames, Story
Freese, W. J., Wiota, Cass
French, John, Goldfield, Wright
Frier, Orville, Boxholm, Boone
From, F J., Halbur, Carroll
Fry, A G., Corydon, Wayne
Fry, R. L., Van Horn, Benton
Fry, S. A., Corydon, Wayne
Fulghum, Les , Charles City, Floyd
**Fuller, F. E., Cedar Falls, Black Hawk
Fuller, Ivan, Fremont, Wapello
Fullerton, Ralph, Albia, Monroe
Furler, Wm., Williamsburg, Iowa
Furler, Albert, Williamsburg, Iowa
Gabbert, M R., Winterset, Madison
Gabble, C. O , Searsboro, Poweshiek
Gaham, W F , Cameron, *Illinois*
Gardner, C L Bancroft, Kossuth
Gardner, C. L , Fenton, Kossuth
Gardner, Innes, Grundy
Gardner, L. C., Fenton, Kossuth
Garland, Des Moines, Polk
Garnett, Ray, Rutland, Palo Alto
Garrett, C. F , Shenandoah, Page
Garton, J. H., Clio, Wayne
Ganmer, Wayne, Hopeville, Clark
Gehringer, John, St. Charles
George, W. R., Ames, Story
Gernard, Fred P., Wadena, Fayette
Gfeller, J. W., Slater, Polk
Gibson, Eli, Creston, Adair
**Gibson, V. C., Clarinda, Page
Gideon, O. L., Norwalk, Warren
Giebelstein, L. B., Ames, Story
Gier, John R., Conrad, Grundy
Gilchrist, E. L., Oskaloosa, Mahaska
Gillett, John, Clarinda, Page
Gillmor, I. H., Denison, Crawford
Glenny, E. B., Union, Hardin
Gochenour, H. F., Red Oak, Montgomery
Goemast, Abraham, Pella, Marion
Goldner, Albert, Tingley, Ringgold
Goodman, Ivan, Williamsburg, Iowa
Gordon, R. S., Reinbeck, Grundy

Gorman, A. L., Gowrie, Webster
**Gosselink, John H., Pella, Marion
Gould, S. T., Gilman, Marshall
Goughnour, E. M., Ankeny, Polk
Gowey, R. B., Brighton, Washington
*Graham, Frank B., Perry, Dallas
Granner, Walter, Eldora, Hardin
Gratke, G. E., Strawberry Point, Clayton
Gray, M. H., Albia, Monroe
Gray, R., Stanhope, Hamilton
Gray, Wm., Albia, Monroe
Grayson, L. B., Boone, Boone
Gregg, W. B., Delphus, Ringgold
Gregg, C. M., Hartford, *South Dakota*
Gregory, J. L., North English, Iowa
Grems, Len G., Armstrong, Emmet
Grey, Walter S., Marathon, Buena Vista
Griffith, A. E., Des Moines, Polk
Griffith, Orlin, Mapleton, Monona
Griffin, E. G., Ionia, Chickasaw
Gronna, Theo., Waterville, Allamakee
Grocz, Geo., Meservey, Cerro Gordo
Grout, Ray, Tingley, Ringgold
Grove, Clare, Jewell, Hamilton
Gue, H. G., Des Moines, Polk
Gunderson, O. E., Forrest City, Winnebago
Gustafson, J. W., Marathon, Buena Vista
Guernsey, S. C., Ferguson, Marshall
Guiles, S. A., Boxholm, Boone
Haahr, Vernon, Newell, Buena Vista
Hagood, Mervin, Oakland, Pottawattamie
Hall, F. W., Colo, Story
Halls, Edward, Lucas
Halls, Fred, Boxholm, Boone
Hall, G. P., Brooklyn, Poweshiek
Hallett, G. W., Sac City, Sac
Hand, Roy, Mingo, Jasper
Hansell, L. G., Indianola, Warren
Hansen, H. A., Canora, *Sask., Can.*
Hansen, Helge, Badger, Webster
Hansen, Ian, Cedar Falls, Black Hawk
Hansen, Fred, Farley, Dubuque
Hansen, L. C., Ruthven, Palo Alto
Haddock, Harry, Rhodes, Marshall
Halgrin, Alvin, Eagle Grove, Wright
Harvard, F. Cherokee, Cherokee
Harvey, W. C., Marion, Linn
Hanson, T. C., Wesley, Kossuth
Hanson, Leslie, Stanhope Hamilton
Hanson, Amos, Humboldt, Humboldt
Hanson, Raymond, Wesley, Kossuth
Hanson, Lars, Collins, Jasper
Hanson, Leslie, Odebolt, Sac
Hanson, R. L., Inwood, Lyon
Hampton, F. D., Springville, Linn
Harbert, Kurfer, Polk
Hardesty, Tom, Ottumwa, Wapello
Hardin, J. F., Eldora, Hardin
Harding, W. C., Strawberry Point, Clayton
Hardy, W. R., Riverside, Washington
Harlan, R., Ottumwa, Wapello
Hartfelder, W. J., Meservey, Cerro Gordo
Harken, C. C., Ft. Dodge, Webster
Harper, Clifford M., Sigourney, Keokuk
Harman, Roy, Plymouth, Cerro Gordo
Harris, H. R., Oskaloosa, Mahaska
Harris, Archie, Manchester, Delaware
Harris, George, Iowa Falls, Franklin
Harris, I. W., Jesup, Buchanan
Harris, W. J., Armstrong, Emmet
Harrison, Claude, Creston, Adams
Hartz, H. D., Wilton, Muscatine
Harvey, J. W., Altoona, Polk
Hasley, Chas., Searsboro, Poweshiek
Hassell, Clarence, Graettinger, Palo Alto
Hastie, Robert, Melport, *Sask., Can.*
Hasting, Theo., Sac City, Sac
Hatch, F. H., Edgewood, Clayton
Hauser, James, Albion, Marshall

Helmer, Hanson, Humboldt, Humboldt
Hansen, U. A., Canora, *Sask., Can.*
Haur, R. S., Cambridge, Story
Hausman, Clarence, Gilbert, Story
Hawbaker, E. H., Stratford, Hamilton
Hawn, F. W., Spencer, Clay
Hays, Dees P., Gillespie, *Illinois*
Hayes, J. D., Persia, Harrison
Hayes, J. H., Neola, Pottawattamie
Haynes, L. J., Des Moines, Polk
Hazen, H. E., Denmark, Clay
Head, C. W., Danville, Des Moines
Heffron, M. J., Hiltman, Monroe
Heiserman, Wm., Manchester, Delaware
Heinselmar, Verl, Plymouth, Worth
Helder, K. E., Inwood, Lyon
Helms, Keen, Madrid, Boone
Herrick, Julius, Exira, Audubon
**Hendricksen, Peter, Dennison, Crawford
Herick, John, Everly, Clay
Hentges, Peter, Alta Vista, Chickasaw
Heugel, A. C., Fenton, Palo Alto
Heugel, R. G., Fenton, Palo Alto
Herrsted, S. A., Ames, Story
Herren, W., Storm Lake, Buena Vista
Herring, Arthur, Galt, Wright
Hertz, A. L., Ames, Story
Hicks, Perly, Clinton, Clinton
Highby, Elmer E., Des Moines, Polk
Higby, Steward, Cedar Falls, Black Hawk
Hill, Donald, Clinton, Clinton
Hill, Glen, Clinton, Clinton
Hill, Clarence, Minburn, Dallas
Hill, E. L., Minburn, Dallas
Hill, Harry, Bondurant, Polk
Hilleson, Lawrence G., Lee, Lee
Hillman, H. J., Deep River, Poweshiek
Hilton, Harry, Malvern, Mills
Hine, C. L., State Center, Marshall
Hinde, A. H., Early, Sac
Hlavaty, V., Cedar Rapids, Linn
Hoffman, George, Des Moines, Polk
Holcomb, H. F., Swea City, Kossuth
Holland, C. M., Brayton, Audubon
Holland, J. C., Brayton, Audubon
*Holliday, W. B., Pocahontas Pocahontas
Hollis, C. A., Cedar Falls, Black Hawk
Holm, Franklin, Thor, Humboldt
Holmes, John J., Hudson, Black Hawk
Holmgreen, John, Ruthven; Palo Alto
Holstrom, W. R., Stratford, Hampton
Homan, John, Halfa, Emmet
Hopkins, C. A., Brandon, Buchanan
Horlacher, J. M., Storm Lake, Buena Vista
Horsman, W. G., Lacona, Warren
Householder, G. W., Newell, Buena Vista
Houser, Limus, Spirit Lake, Dickinson
Houser, I. W., Ames, Story
Hoversteen, J. T., Story City, Story
Hoverstein, T. T., Newell, Hamilton
Howard, Edgar M., Pawnee, *Illinois*
Howard, E. B., Ames, Story
Howell, Harry, Muscatine, Muscatine
Howell, H. C., Muscatine, Muscatine
Hoyer, F. J., Burnside, Webster
Hristur, E. Elma, Howard
Hudek, Lewis, Pocahontas, Pocahontas
Hudson, B. E., Montezuma, Poweshiek
Huffman, L. C., Ionia, Chickasaw
Hujner, Darwin, Marion, Linn
Hujner, Spencer, Marion, Linn
Hughes, Darold, Nashua, Chickasaw
Hughes, H. Charles City, Floyd
Hughes, E. P., West Bend, Palo Alto
Hughes, Clark, Paullina, O'Brien
Hughs, W. J., Cedar Rapids, Linn
Hughes, W. P., Dunkerton, Black Hawk
Hutchins, Hugh, Rippey, Boone
Humhe, Clarence, Ackley, Hardin

Hummel, M., Fonda, Pocahontas
Hungerford, L. N., Nashua, Chickasaw
Hunt, W. J., Ocheydan, Osceola
Hunter, D. R., Silvan, Monona
Hunter, W. E., Audubon, Audubon
Husted, Eugene, Osceola, Clark
Huston, Vaughn, Early, Sac
Hutchison, W. C., Dawson, Dallas
Inglesby, E. E., Gilbert, Story
Ingelsby, Edward, Gilbert, Story
Ingrum, G. F., Montezuma, Poweshiek
Irvin, Guy, Marengo, Iowa
Irving, W. J., Webster City, Hamilton
Irving, George, Mt. Ayr, Ringgold
Isaac, P. H., Red Oak, Montgomery
Isvik, A .M., Jewell, Hamilton
Ives, Robert, Danbury, Woodbury
Jacobson, T., Graettinger, Palo Alto
**Jargo, Ervin, Andover, Clinton
Jacobson, Harold, Ottosen, Humboldt
Jeanblanc, Charles, Lee Center, Lee
Jeffers, L. H., Laurens, Pocahontas
Jenison, Cloe, Belmond, Wright
Jenkins, O. M., Adel, Dallas
Jennings, R. G., Redding, Ringgold
Jenson, John, Rolfe, Palo Alto
Jensen, Clifford, Irwin, Shelby
Jensen, Frank, Schleswig, Crawford
Jensen, J. C. H., Brayton, Audubon
Jensen, M. C., Grundy Center, Grundy
Jensen, M., Laurigan, *Sask., Can.*
Jenson, Peter, Alta, Buena Vista
Jensen, M., Laurzan, *Sask., Can*
Jenson, J. H., Newell, Buena Vista
Jewell, Oscar, Rockford, Floyd
Johnson, A. E., Laurens, Pocahontas
Johnson, G. F., Hudson, Black Hawk
Johnson, C. O, Sheldahl, Story
Johnson, J., Casey, Adair
Johnson, Mullin, Armstrong, Emmett
Johnson, E. D., Harlan, Shelby
Johnson, H. W., Ames, Story
**Johnson, R., Cherokee, Cherokee
Johnson, E. A., Oskaloosa, Mahaska
Johnson, W., Beatrice, Page
Johnson, Walter, Curlew, Palo Alto
Johnson, Gus, Harcourt, Webster
Jones, F. R., Brighton, Washington
Jones, George, Cambridge, Story
Jones, G. R., Columbus Jct., Louisa
Jordan, L. D., Pleasantville, Marion
Jorgenson, Henry, Waterloo, Black Hawk
**Jorstad, Otis, McCallsburg, Story
Judge, J. T. F., Melrose, Monroe
Junker, M. P., Ruthven, Palo Alto
Kadolph, Charles, Eldora, Hardin
Kahrs, L. C., Story City, Story
Kalsem, P. S., Ames, Story
Kosman, B. Ottumwa, Wapello
Kassel, D. F., Ayrshire, Palo Alto
Kelley, B. H., Indianola, Warren
Kelly, H. P., Cedar Rapids, Linn
Kelley, J. J., Williamsburg, Iowa
Kennedy, Carl N., Des Moines, Polk
Kent, Audley, Stanhope, Hamilton
Kenny, Ralph, Bronson, Woodbury
Kepler, Dewey, Stanhope, Hamilton
Kepler, F., Stanhope, Hamilton
Kerr, Harry, Little Sioux, Harrison
Ketcham, Dwight, Muscatine, Muscatine
Kilbourne, A. S., Eddyville, Wapello
King, G. E., La Porte, Black Hawk
King, J. A., Norwalk, Warren
King, A. L., Montezuma, Poweshiek
Kingsbury, Ben, Ames, Story
Kingsbury, Henry, Ames, Story
Kipler, William, Cedar Rapids, Linn
Klans, Harry E., Nilwood, *Illinois*
Klepke, A. F., Eldora, Hardin
Klepke, J. J., Eldora, Hardin
Klosterman, A. B., Dyersville, Dubuque
Knauss, Jermayne, Logan, Harrison
Knauss, H. J., Logan, Harrison
Kness, Ralph, Hamlin, Audubon
Knight, Homer, Woodbine, Harrison
Knotek, Joe, Riverside, Washington
Knudson, E. E., Lake City, Calhoun
Koch, P C., Maquoketa, Jackson
Koenig, E. L. Merrill, Plymouth
Kolash, Frank, Prescott, Adams
Korf, C. C , Olds, Henry
Korslund, Edwin, Thor, Humboldt
Krause, Carl, Eldora, Hardin
Krieger, Rudolph, Rippey, Greene
Krizer, Willis, Eddyville, Mahaska
Krisinger, F. F., Prescott, Adams
Kruger, W. E., Eddyville, Mahaska
Kruse, Arthur, Marshalltown, Marshall
Kruse, E. H., Newell, Buena Vista
Kruse, G. F., Newell, Buena Vista
Kryce, Louis, Cedar Rapids, Linn
Kuch, George W., Rockford, Floyd
Kuffman, H. T., Le Mars, Plymouth
Kushmeder, Lewis, Tripoli, Bremer
Lads, Byron, Williamsburg, Iowa
Lafrentz, Nick, Schleswig, Crawford
Laird, J. P., St. Charles, Warren
Lang, Fred, Spencer, Clay
Lang, Herbert, Carlisle, Warren
Lang, E. J., Remsen, Plymouth
Lang, F. E., Spirit Lake, Dickinson
Lang, Walter, Remsen, Plymouth,
Lange, Fremont E., Strawberry Point, Clayton
Landsgord, James, Story City, Boone
Lanier, Charles, Dayton, *Wyoming*
Lansman, Harry, Irwin, Shelby
Larimer, J S., Orland, *Indiana*
Larison, C. H., Mondamin, Harrison
Larson, Alfred, Audubon, Audubon
Larson, A., Story City, Story
Larson, Albert, Mo. Valley, Harrison
Larson, U. S., Alta, Buena Vista
Lash, Fred, Barnes City, Poweshiek
Law, Vance, Armstrong, Emmett
Law, V. V , Richard, *Sask., Can.*
Lawman, John, Rodman, Palo Alto
Lawson, Wallace, Sunny Hill, *Illinois*
Lawton, Harvey, Cooper, Greene
Lee, C., Sac City, Sac
Leahey, Melvin, Dennison, Crawford
Lehman, H. L., Boxholm, Boone
Leigh, Gordon, Lenox, Taylor
**Leighton, Roe, Sioux Rapids, Buena Vista
Lenz, Ed., Carroll, Carroll
Leo, Meava, Williamsburg, Iowa
Leonard, William, Swaledale, Cerro Gordo
*Lerdall, Floyd, Ames, Story
Lester, Raymond, Clarinda, Page
Levorson, H., Lake Mills, Worth
Lewis, Glenn, Woodbine, Harrison
Lewiston, R., Sioux Rapids, Buena Vista
Liljegrin, W. M., Dayton, Webster
Lillesker, Thomas, Eagle Grove, Wright
Lind, Rudolph, Boxholm, Boone
Lister, C. C., Tiffan, *Ohio*
Lincoln, John C., Grinnell, Poweshiek
Linderman, Lester, Pocahontas, Pocahontas
Livermore, F. A., Moville, Woodbury
Lineweaver, H. W., South English, Keokuk
Ling, M. S., Des Moines, Polk
Linsley, H. A., Wright, Mahaska
Livington, Munson, Monroe, Jasper
Lofshult, Gus, Sloan, Woodbury
Lofshult, Joseph, Sloan, Woodbury
Lofshult, P., Sloan, Woodbury
Long, C. H., Farrar, Jasper
Loose, Huvert, Thurman, Fremont

Loughridge, R. B., Delta, Keokuk
Loughridge, J. A., Delta, Keokuk
Lounsbury, G. L., Colo, Story
Ludwig, G. H., Nevada, Story
Luke, Vernon, Sac City, Sac
Lund, L. B. Stanhope, Hamilton
Lundberg, A. E., Gowrie, Webster
Lundvall, David, Boxholm, Boone
Lundgren, Clarence, Lundgren, Webster
Lyle, Clements, Grimes, Polk
Lyle, Kerman I., Sheldon, O'Brien
Lytle, J. P., Oskaloosa, Mahaska
Lytle, Roy J., Oskaloosa, Mahaska
Maakstad, W. T., Ft. Dodge, Webster
Macauley, Paul, Burt, Kossuth
Machomer, A. D., Kent, *Illoinois*
Madison, W. J., Casey, Adair
Maggard, Geo. T., Houston, *Texas*
Malmberg, A. E., Stanhope, Hamilton
Malmquist, Carl, Boxholm, Boone
Marker, Van, Rockford, Floyd
Marshall, Geo., Arlington, *Nebraska*
Martin, H. S., Thurman, Fremont
Martin, Kent, Shenandoah, Page
Martin, M. W., Hancock, Pottawattamie
Martin, Arch, Sidney, Fremont
*Martin, W. B., Denver, *Colorado*
Martin, Jolvert, Elma, Howard
Marvich, A. M., Story City, Story
Mason, Duane, Early, Sac
Maas, M. A., Washington, Washington
Maas, M. J., Iowa City, Johnson
Marsh, K., Lehigh, Webster
Mathews, Willis, Danville, Des Moines
Matt, Louis, Jr., St. Olaf, Clayton
*Matzen, Paul, Mason City, Cerro Gordo
Mathis, J. H., Ankeny, Polk
May, E. E., Shenandoah, Page
Maynard, E. J., State College, *New Mexico*
Mauny, Fred, Ft. Madison, Lee
Mease, J. L., Truro, Madison
*Meckley, Clifford, Colfax, Jasper
Meder, C. J., Clayton, Clayton
Meeker, R. J., Ames, Story
Meilike, A. W., St. Charles, Warren
Meneough, E. M., Grimes, Polk
Meredith, Clifford H., Searsboro, Poweshiek
Merkel, H. L., Des Moines, Polk
Merkel, J. W., Des Moines, Polk
Merrill, J. C., Milford, Dickinson
Merrill, J. W., Muscatine, Muscatine
Merritt, Clarence, Allerton, Wayne
Meyers, L. M., Auburn, Sac
Meyer, George, Ringsted, Emmett
Meyer, E. E., Newton, Jasper
Meyer, Leonard, Kauaranzi, *Minnesota*
Meyerring, Henry, Neola, Pottawattamie
Meythler, Mervin, Independence, Buchanan
Middleton, A. L., Eagle Grove, Wright
Miers, A. W., N. Buena Vista, Dubuque
Miles, S. J., Newton, Jasper
Miller, Lyman, Shenandoah, Page
Miller, R. A., Sutherland, O'Brien
Miller, W. A., Adel, Dallas
Miller, Ayrill D., Guttenburg, Dayton
Milleson, C. A., Prairie City, Jasper
**Mills, Ralph, Coggon, Linn
Mills, M. K., Providence, Hardin
Milton, Frank, Webster, Hamilton
Miner, T. Ralph, Knoxville, Marion
Minerman, Walter, Exira, Audubon
Minich, G. A., Carroll, Carroll
Minor, O. S., Churdan, Greene
Miguelom, Cyr., Sloan, Woodbury
Mitchell, F. A., Iowa Falls, Hardin
*Mitchell, J. R., Churdan, Greene
Mitchell, Lyell, Spirit Lake, Dickinson
Mitchell, L. A., Iowa Falls, Hardin
*Mitchell, Paul, Reinbeck, Grundy
Mitchener, D. W., Truro, Madison
Molanbert, A. E., Stanhope, Hamilton
Morton, B. E., Rockwell City, Calhoun
Moad, C. C., Lake City, Calhoun
Moellering, R. H., Garnavillo, Clayton
Monson, C., Gowrie, Webster
Montgomeng, R. J., Ames, Story
Moon, B. T., Cedar Falls, Black Hawk
Moore, Dan, Ames, Story
Morehouse, K. V., Ontario, Story
**Moody, Chris, Muscatine, Muscatine
Morell, Fred, Colo, Story
**Morey, Irvin, West Bend, Palo Alto
Morris, E. F., New Providence, Hardin
Morse, Henry G., Marengo, Iowa
Moser, W. B., Waterloo, Black Hawk
Mott, F. L., Truesdale, Buena Vista
Mundy, M. L., Marshalltown, Marshall
Murchison, Kenneth, Griswold, Cass
Muzzey, Merrill, Waterloo, Black Hawk
Myers, L. E., Ida Grove, Ida
Myer, Earl, Van Meter, Dallas
Mynard, Dwight, Ambold, Lee
McArthur, J. C., Mason City, Cerro Gordo
McCane, L. J., Humeston, Wayne
McCarron, Glen, Maquoketa, Jackson
McCloyd, A. E., Belle Plaine, Benton
McClure, W. E., Ames, Story
**McComb, James, Hayworth, *McClaire, Ill.*
*McConnell, R. E., Somers, Calhoun
McCornack, Howard, Prescott, Adams
McCullock, Fred, Belle Plaine, Benton
McCusker, M. M., Norwalk, Warren
McCreary, Jas. Gilman City, Story
McDonough, L. J., Barnum, Webster
McGrath, Frank, Ontario, Story
*McHugh, Leonard E., Spencer, Clay
McKee, Clyde, Ames, Story
McKissack, Carl, Albia, Monroe
McKissack, R. J., Albia, Monroe
McLaughlin, C. M., Rock Rapids, Ryan
McMahon, Ralph, Rockwell City, Calhoun
McMahon, W. J., Manchester, Delaware
McMillan, P. J., Mable, *Minnesota*
McMurray, Murray, Webster City, Hamilton
McNeal, F. R., West Branch, Cedar
McCable, T. J., Humeston, Wayne
McQuenn, A. B., Osceola, Clarke
Nathass, L. A., Spencer, Clay
**Naughton, Walsh, Denison, Crawford
Naylor, T. B., Bagley, Guthrie
Neel, W. A., Webster City, Hamilton
Nelson, Arthur, Terrill, Dickinson
Nelson, Carl Jewell, Hamilton
Nels, Sig, Stanhope, Hamilton
Nelson, Chester, Jewell, Hamilton
Nelson, G. S., Ames, Story
Nelson, Harold, Eagle Grove, Wright
Nelson, H. H., Mo. Valley, Harrison
Nelson, Milton A., Mo. Valley, Harrison
Newburn, F. E., Eagle Grove, Wright
Newman, Clayton, Mitchellville, Polk
Nicholaus, W. L., Crawfordsville, Washington
Nichols, M. W., Bradgate, Humboldt
Nienan, L. H., Guttenburg Clayton
Niland, Reid, Colo, Story
Krizen, N. H., Rose Hill, Mahaska
Nissen, Chris, Cedar Falls, Black Hawk
Nissly, J. C., Dallas Center, Dallas
Nissly, P. L., Dallas Center, Dallas
Noble, M. H., Riceville, Mitchell
Noland, W. J., Woodward, Dallas
Nordhauser, J. H., Manson, Calhoun
Northey, Claude, Milford, Dickinson
Northup, Floyd, Lewis, Pottawattamie
Northup, M. L., Lewis, Pottawattamie
Nurra, J. J., Bancroft, Kossuth
Nelson, Dick, Stanhope, Hamilton
Nyman, J. P., Bancroft, Kossuth

Oberdind, F. O., Dyersville, Dubuque
O'Dell, Bruce, Gravity, Taylor
O'Dell, Lawrence, Gravity, Taylor
Okerbloom, Carl, Lynncenter, *Illinois*
Oliver, Willard, Redding, Ringgold
Ollinger, John, Jr., Keota, Keokuk
Olsen, Carl, Ottosen, Humboldt
Olson, Lloyd, Eagle Grove, Wright
Olson, Elmer, Boxholm, Boone
Olson, Jeffrey, Wallingford, Emmett
Olson, Ole, Clinton, Clinton
**Olson, Sanford, Story City, Story
O'Malley, W. B, Benton, Dallas
O'Mara, E., Louisville, *Kentucky*
Ombly, Ira, Independence, Buchanan
Onee, Henry, Milford, Dickinson
Orton, Iehl, Walker, Linn
Onnerim, O L. O, Thor, Humboldt
Ornes, J., Woonsocket, *South Dakota*
Orr, Harold, Columbus Jct, Louisa
Orr, Ralph, Armstrong, Emmett
Osmore, Tony, Neola, Pottawattamie
Osterlan, H. F., Ackley, Hardin
Osterkamp, Geo. O, Gillespie, *Illinois*
Oswald, W S, Minneapolis, *Minnesota*
Overman, R M, Sioux Rapids, Buena Vista
**Overmyer, R. M., Sioux Rapids, Buena Vista
Overly, H V, Ames, Story
Overman, E. W., Maquoketa, Jackson
Owens, Gordon, Carlisle, Warren
Owens, Hugh, Williamsburg, Iowa
Ozmun, A. C Collins, Story
Ozmund, H F., Collins, Story
Paige, Clayton, Ft. Dodge, Webster
Paine, Fred S., Mingo, Jasper
Palmer, R, Oakland, Pottawattamie
Palmer, George, Oakland, Pottawattamie
*Parker, Clarence, Oakland, Pottawattamie
Parlet, R. E., Oskaloosa, Mahaska
Parrott, W F., Waterloo, Black Hawk
Parsons, Mark, Douds, Van Buren
Patterson, Jas., Plainfield, *Illinois*
Patterson, B M., Winterset, Madison
Patterson, Clint, Elgin, Fayette
Patterson, F. A, Stratford, Hamilton
Patterson, L. H, Elkader, Clayton
Patton, J O, Albia, Monroe
Patrie, Kenneth, Prairie City, Jasper
Paul, Burton, Kellogg, Jasper
Pauley, William, Vinton, Benton
Pavlik, Edward, Merrill, Plymouth
Pearson, Melvin, Mitchelville, Polk
Pederson, T. N., Bode, Humboldt
Pegram, Glenn, Carlisle, Warren
Pellett, Frank, Atlantic, Cass
Pendleton, G L, Essex, Page
Penrod, M F, Slater, Story
Person, Elmer E, Ames, Story
Peter, Paul, Ankeny, Polk
Peterson, Archie, Stanhope, Hamilton
Peterson, C B, Exira, Audubon
Peterson, C A, Harcourt, Webster
Peterson, Don, Red Oak, Montgomery
Peterson, Earnest, Laurens, Pocahontas
Peterson, Herman, Kelly, Boone
Peterson, A. O, Kelly, Boone
Peterson, J, Lake Mills, Winnebago
Peterson, H. J, Mo Valley, Pottawattamie
Peterson, Peder, Cedar Falls, Black Hawk
Peterson, Ralph, Boxholm, Boone
Peterson, Vern, Kirkman, Shelby
Peterson, W. E, Kirkman, Shelby
Pelty, J. H, Elliott, Montgomery
Petty, D. H, Elliott, Montgomery
Pettinger, Albert, Shannon City, Union
Peyton, Dolph, Sac City, Sac
Phelp, Earl, Waukee, Dallas
Phillips, W. M., Berkeley, Boone
Phillips, C. E., Washington, Washington
Picksvioll, M. K., Eddyville Mahaska
Pieper, E. A., Mt. Hamil, Lee
Pilmer, E. H., Norwalk, Warren
Pladson, Emil, Des Moines, Polk
Platt, Geo. G., Oelwein, Fayette
Plumb, C. S., Henderson, Mills
Pollock, Rowley, Cumberland, Cass
Polly, E. C., Sloan, Woodbury
Pope, Lawrence, Oakland, Pottawattamie
Pritchard, A. L., Indianola, Warren
Posey, W. A., Spencer, Clay
Poyser, J. F., Spirit Lake, Dickinson
Prall, Arthur, Carlisle, Warren
Price, Le Roy, Grundy Center, Grundy
Price, Albert, Eldora, Hardin
Proudfit, J. E., Altoona, Polk
Putnam, P. R., Montezuma, Poweshiek
Putter, P A., Ames, Story
Query, Thos., Melrose, Wayne
Qilk, Orlen, Walker, Linn
Quist, W. H., Des Moines, Polk
Rabe, E. C, Alta Vista, Chickasaw
Rabel, A S., Ottumwa, Wapello
Radebaugh, J. W., Waukee, Dallas
Randall, Emmett, Strawberry Point, Clayton
Rang, Fred, Milford, Dickinson
Range, M. E., Milford, Dickinson
Ratzlaff, O. A., Atlantic, Cass
Raymond, Lambert, Buckingham, Tama
Redman, J. R., Ft. Dodge, Webster
Reeb, Earnest, Burlington, Des Moines
Reed, E. E, Regina, *Sask., Can.*
Reed, F P, Ames, Story
Reed, M. K, Sloan, Woodbury
Reed, Robert, Ft.Dodge, Webster
Reese, R. L, New Providence, Hardin
Rehnblem, Philip, Stanhope, Hamilton
Reidy, W T., Cedar Rapids, Linn
Reimer, Alvert, Schleswig, Crawford
Reifern, Ray, Yarmouth, Des Moines
Reinhart, Geo, Carroll, Carroll
Reisn, L M., Radcliffe, Hardin
Reno, A. R, Terril, Dickinson
Renolds, C R, Lake City, Calhoun
Renolds, Jess, Lake City, Calhoun
Renquist, Emery, Gowrie, Webster
Renquist, Milton, Gowrie, Webster
Repp, Fred, Minburn, Dallas
Reutler, Clarence, Boxholm, Boone
Reutinger, Charles, Wapello, Louisa
Reutter, Ralph, Boxholm, Boone
Reynolds, Wm, Iowa City, Johnson
Rhoades, A A, Jefferson, Greene
Rhoden, Melville, Lanyon, Webster
Rice, C. A, Gladbrook, Iowa
Richards, C R, Cambridge, Story
Richardson, Early, Gravity, Taylor
Richardson, H. R, Ft. Dodge, Webster
Richmond, Wayne, Armstrong Emmett
Richmond, Wallace, Armstrong, Emmett
Rider, O E., Farmington, Van Buren
Riebel, F M, Arbela, *Missouri*
Reilly, J H, Rock Valley, Sioux
Rinehart, G, Carroll, Carroll
Ripley, E, Lake City, Calhoun
Ritland, Carl, Rock Valley, Sioux
Rittgers, F D., Dallas Center, Dallas
Rittges, E C, Grimes, Polk
Rittgeas, Francis, Dallas Center, Dallas
Rivers, Jake, Searsboro, Poweshiek
Robb, Floyd, Britt, Hancock
Roberts, C. E, Storm Lake, Buena Vista
Roberts, W T, Ames, Story
Robinson, E O, Ames, Story
Rode, H G., Muscatine, Muscatine
Rodney, Jackson, Bagley, Guthrie
Roflofsz, H C, Jefferson, Greene
Rooda, I. G., Pella, Marion

Rooney, E. F., Farrar, Polk
Rosburg, R. W., Eldora, Hardin
Roseman, Alvin, Germania, Kossuth
Rosmusson, R A., Nevada, Story
Ross, J. R., Rock City, Calhoun
Ross, W. H., Waterloo, Black Hawk
Rounds, Howard, Hancock, Pottawattamie
Royer, A. C., Dallas Center, Dallas
Royer, Rudy, Dallas Center, Dallas
Rowley, W. G., Hopkinton, Delaware
Reef, Leo, Sperry, Des Moines
Rusted, L. C., Wallingford, Emmett
Ryan, Wm. J, Mitchellville, Polk
Sar, M. E., Essex, Page
Sargisson, Walter, Sioux City, Woodbury
Sargisson, Leo, Sioux City, Woodbury
Sargisson, P., Sioux City, Woodbury
Salisbury, G., Glidden, Carroll
Salisbury, O. P., Glidden, Carroll
Salton, Arthur, Marathon, Buena Vista
Salsman, A. T., Mt, Pleasant, Henry
Samuels, Floid, Goldfield, Wright
Sandgren, Rudolph, Madrid, Boone
Sanders, E., Iowa City, Johnson
Sankot, Atlo, Belle Plaine, Benton
**Satterthwaite, Mayard, Muscatine, Muscatine
Satterthwaite, Fred, Muscatine, Muscatine
Sagvik, G. M., Gilbert, Winnieshiek
Sawin, H. W., Northwood, Worth
Sawyer, C. W., Sargeants' Bluffs, Woodbury
Sawyer, G. A., Kelly, Story
Schaffer, S. R., Redding, Ringgold
Scharnberg, T. G., Everly, Clay
Schleer, Herman, Ryan, Delaware
Sayers, S. D., Des Moines, Polk
Scheibe, Paul F., Waterloo, Black Hawk
Scheer, Henry, Ryan, Delaware
Schichter, C. H., Marshalltown, Marshall
Schlafte, F. S., Jewell, Hamilton
Schleifforth, A. R., Belmond, Wright
Schlue, W. M., Van Horn, Benton
Schmid, Ulrich, Kirkman, Shelby
Schoech, C Ottumwa, Wapello
Schroeder, R. J, Holstein, Ida
Schroedermier, H. E., Waverly, Bremer
Schuenke, Otto, Calumet, O'Brien
Schultheiss, Gustav, Delta, Keokuk
Schunk, C F., Wright, Mahaska
Schwab, Ira, Whitten, Grundy
Schrank, Simon, Danbury, Woodbury
Schroeder, Rollo, Holstein, Cherokee
Schwantz, Arthur I., Lorimor, Union
**Schwartz, H. L., Albion, Marshall
Schwenden, W., Burnside, Webster
Scholes, Sam, Nashua, Chickasaw
Scott, J G, Shipley, Story
Scott, Rutdgle, Early, Sac
Scott, Jay, Marion, Linn
**Scott, Harold, Marion, Linn
Scoville, R M., Kellogg, Jasper
Scurr, J. Harry, Gilman, Marshall
**Seaton, Dwight, Danville, Des Moines
Seaton, Orr, Delphos, Ringgold
Sefrit, Frank, Delphos, Ringgold
**Seiberling, Richard, Mitchellville, Polk
Scalin, Ruben, Stanhope, Hamilton
Sirup, J. C., Iowa City, Johnson
Swenson, L., Carthage, *South Dakota*
Sewell, L. P., Bedford, Taylor
Sewtell, Wayne, Danville, Des Moines
Sexauer, Theo., Ames, Story
Shannon, W. E., St, Charles, Warren
Sharp, Ray, Spirit Lake, Dickinson
Sharp, Earnest, Spirit Lake, Dickinson
Shea, O. R., Fonda, Pocahontas
Sheppard, L., Onawa, Monona
Shearer, F L., Ames, Story
Sheets, O R., Des Moines, Polk
Shellbarger, R W., Letts, Muscatine
Shields, John B., Fairbanks, Buchanan
Shirk, I. N., Grundy Center, Grundy
Shimon, H. A., Havelock, Pocahontas
Sheplee, G. B., Clarion, Wright
Schoenberger, John, Winterset, Madison
Short, William, Pocahontas, Pocahontas
Shuts, Grover, Bassett, Chickasaw
Siemens, Marinus, Goldfield, Wright
Sigle, F. C., Indianola, Warren
Silcott, J. W., Indianola, Warren
Sidles, Maurice, Boxholm, Boone
Simmons, D. N., Humboldt, Humboldt
Simmons, J. F., Humboldt, Humboldt
Siversind, Oto, Inwood, Lyon
Skoglund, Bert, Lanyon, Webster
Slingerland, C. E., Ames, Story
Slingerland, G. E., Ames, Story
Sloan, W. G., Leeds, Woodbury
Slocum, K. D., Clinton, Clinton
Slocum, H. A., Slater, Polk
Small, A. H., Letts, Louisa
Small, Dewey, Wapello, Louisa
Small, J G., Letts, Louisa
Snook, Walter, Ottawa, *Illinois*
Smorenberg, T. Pella, Marion
Sminson, W. F., Boxholm, Boone
Smith, E. S., Mason City Cerro Gordo
Smith, G P., Ely, Linn
Smith, Millard, Stanhope, Hamilton
Smith, Lenord, Mason City, Cerro Gordo
Smith, Robt., Eldora, Hardin
Smith, G F., Rolfe, Pocahontas
Smith, Ora E., Jefferson, Greene
Smith, Peter, Newell, Buena Vista
Smith, W. L, Redfield, Dallas
Sundberg, John, Sioux City, Woodbury
Snell, L. V., Mason City, Cerro Gordo
Snyder, D. C., Center Point, Linn
Snyder, Harold, Stanhope, Hamilton
Snyder, Lee, Oxford, Johnson
Snyder, Lowell, Stanhope, Hamilton
Sojka, Ray, Riverside, Washington
Sojka, Claude, Riverside, Washington
Soeth, Max, Wallingford, Emmett
Soldager, Godfrey, Cedar Falls, Black Hawk
**Soorholtz, Howard, Melbourne, Marshall
Sovers, Marshall, Ankeny, Polk
Sparboe, Anton, Ellsworth, Homilton
Sparbee, Carther, Ellsworth, Hamilton
Spencer, Merritt, Delphic, Ringgold
Spiker, Roy, Gunwald, Lucas
Spratt, W. C., Carlisle, Warren
Spring, H. B., Udel, Appanoose
Spade, W. D., Oasis, Johnson
Splindler, Louis, Schaller, Sac
**Spurrier, L. H, Macoun, *Sask., Can.*
Sonder, Chas, Clio, Wayne
Sowers, Glenn, Henderson, Mills
Stall, Carl, Grimes, Polk
Stanfield, W. W, Denison, Crawford
Standley, G. W., Boone, Boone
Stanley, L. B, Springville, Linn
Stark, Everett, Stanhope, Hamilton
Stark, Ray, Boxholm, Boone
Statter, G P., Sioux, Woodbury
Steil, J. W., Mason City, Cerro Gordo
Steil, Vern, Mason City, Cerro Gordo
Stenbreker, Gaynor, Independence, Buchanan
Stensrud, Ednur, Lake Mills, Winnebago
**Stevenson, C. W, West Bend, Buena Vista
**Stephenson, E R., Lanyon, Webster
Stevenson, Harold, Shannon City, Union
Stimson, Roy, Manchester, Delaware
Stoddard, J. S.
Stokes, R K., Arlington, Fayette
Stoeting, E., Schaller, Sac
Stoeting, Fred, Schaller, Sac
Stout, Alfred, Jewell, Hamilton
Stout, E. T., Jewell, Hamilton

Strong, John, Thor, Humboldt
Strong, Stewart, Thor, Humboldt
Strayer, Earl, Waterloo, Black Hawk
Streeter, Carl, Collins, Jasper
Strugan, John, Dickens, Clay
Stubbs, W. F., Ft. Worth, *Texas*
Stuber, N. H., Woodward, Dallas
Suha, Julius, Coon Rapids, Carroll
Summey, M. J., Dunlap, Harrison
Sundbery, Jno., Sioux City, Woodbury
Surfus, A. L., Bristow. Butler
Swardner, A. V., Halfa, Emmett
Swanson, Clarence, Boxholm, Boone
Swanson, E. A., Boxholm, Boone
Swanson, Edwin, Mt. Ayr, Ringgold
Swanson, H. L., Superior, Dickinson
Swanson, O. T., Gowrie, Webster
Swensind, Alfred, Northwood, Worth
Swearingen, Glenn, Winfield, Henry
Sweeny, E. J., N. Buena Vista, Dubuque
Sweeny, Ren, Sanburn, O'Brien
Swenson, Nels, Carthage, *South Dakota*
Swiger, Arthur N. Jefferson, Greene
Swinford, D., Arkoe, *Missouri*
Sylvia, W., Story City, Story
Sylvester, John, Glidden, Carroll
**Taber, Clifford, Springville, Linn
Taft, C. F., Silver City, Mills
Taft, Geo. S., Sioux City, Woodbury
Taft, G. A., Sioux City, Woodbury
Tann, Clarence, Schleswig, Crawford
Tansey, Lee, Rolfe, Palo Alto
Tardal, E. J., Stanhope, Hamilton
Tate, John M., Winterset, Madison
Taylor, I. N., Oskaloosa, Mahaska
Tylor, R. S., Ames, Story
Tegeler, T. J., Farley, Dubuque
Tennis, K. L., Wright, Mahaska
Textrem, J. F., Ames, Story
Thatcher, R. J., Mitchellville, Polk
Thom, Wm. M., Minonk, *Illinois*
Thomas, Charles, Orient, Adair
Thomas, D. F., Des Moines, Polk
Thomas, Geo., Woodward, Dallas
Thomas, J. A., Iowa City, Johnson
Thomas, Robt. M., Tipton, Cedar
Thomassen, H. R., Van Meter,, Dallas
Thompson, Allen, Des Moines, Polk
Thompson, Harold, Ringsted, Emmett
**Thompson, Albert, Lake Mills, Winnebago
Thompson, T. A., Leland, Winnebago
Thompson, Will, Jesup, Black Hawk
Thompson, I. K., Beloit, Lyon
Thompson, Lew, Williams, Hamilton
Thompson, L. T., Forrest City, Winnebago
Thompson, M. T., Ruthven, Palo Alto
Thompson, S. H., Ames, Story
Thrall, W. M., Gowrie, Webster
Throw, F. W., Sherwood, Calhoun
Tiernan, Joe, Patterson, Madison
Tokhiam, A. J., Thor, Humboldt
Toonan, Geo., Waterloo, Black Hawk
Toot, Clarence, Nevada, Story
Topf, N. W., Mapleton, Monona
Torrance, George, Oskaloosa, Mahaska
Torreson, C. T., Wallingford, Emmett
Towle, L. T., Ames, Story
Tracy, F. A., Osage, Mitchell
Tracy, F. E., Nashua, Chickasaw
Tripp, Geo., Ames, Story
Tryssell, Lewis, Albia, Monroe
Tullis, Jack, Decatur, Decatur
Tundplad, F. G., Laurens, Pocahontas
Tutjin, Milt, Jesup, Black Hawk
Turler, A., Williamsburg, Iowa
Uhl, Lester, Brooklyn, Poweshiek
Umschide, Myron, Milford, Dickinson
Unsicker, Carl, Wright, Mahaska
Ury, Glenn, Jonesboro, *Illinois*

Van Alstine, P. B., Gilmore City, Humboldt
Vanderlinden, Luke, Prairie City, Jasper
Van Dekamp, W., Colfax, Jasper
Vandervort, G. W., Jaywroth, *Illinois*
Vanderwelt, Autory, Boyden, Sioux
Vanderwilt, Anthony, Boyden, Sioux
Van Brimmelman, R. H., Newton, Jasper
Van Fossen, Clarence, Adel, Dallas
Van Pilsum, Arie, Prairie City, Jasper
Varnum, J. B., Sunnyville, *South Dakota*
Varnum, J. T., Sunnyville, *South Dakota*
Vandermeer, J. F., Hospers, Sioux
Van Vleck, C. H., Atlantic, Cass
**Vaughn, Walter, Marion, Linn
Vetter, Paul, Boxholm, Boone
Victes, Felter, Des Moines, Polk
**Van Zante, Albert, Pella, Marion
**Van Zee, A. G., Pella, Marion
Vangundy, O. M., Slater, Story
Von Oven, T. W., Naperville, *Illinois*
Wills, E. J., Dallas, *South Dakota*
Wells, H. E., Cresco, Howard
Well, P. G., Sumner, Linn
Wade, Wm. M., Woodward, Dallas
Wagner, R. W., Clemons, Marshall
Wahl, Fred, Boone, Boone
Wahl, L. W., Boone, Boone
Waldruff, Cecil, Braddyville, Page
Walker, E. W., Roland, Story
Walker, Ben, Eldora, Hardin
Walker, Guy, Boone, Boone
Walkner, F. W., Renwick, Humboldt
Walker, S. A., Iowa City, Johnson
Walker, Verne, Boxholm, Boone
Wall, George, Burdette, Franklin
Wallace, Buck, Mt. Ayr, Ringgold
Walton, Ralph, Oakland, Pottawattamie
Ware, Austin, Oakland, Pottawattamie
Warner, A. L,. Hepburn, Page
Warner, V. G., Bloomfield, Davis
Waterman, R. P , Kamrar, Hamilton
Watson, Davis, Castana, Monona
Warnke, A., Carroll, Carroll
Way, L. P , Bussey, Mahaska
Weatherbee, Paul, Central City, Linn
Weeks, D. P , Woodstock, *Minnesota*
Weeks, H. T., Kelley, Story
Weber, Floyd, Ackley, Hardin
Wilbur, Othlon, Spirit Lake, Dickinson
Webber, Edmund, Laporte City, Black Hawk
Wehling, H., Denver, Bremer
Welch, O. L., Sciota, *Illinois*
Welch, Wm , Masonville, Delaware
Welton, J E., Oskaloosa, Mahaska
Welty, K. B., Spirit Lake, Dickinson
West, L. C , Reynolds, Marion
Western, C. A., Beaconsfield, Ringgold
Weston, C. E , Ames, Story
Wesley, Ash J., Allerton, Wayne
Wetherbee, O L., Central City, Linn
Whaley, Donald, Austinville, Hardin
Wheat, A. J., Ft. Dodge, Webster
Wheeler, R J., Battle Creek, Ida
Whipple, R. E , Lewis, Pottawattamie
White, C. E., Council Bluffs, Pottawattamie
White, Harvy, Cooper, Greene
White, James, Rhodes, Marshall
Whiton, R. R., Perry, Dallas
Wiggens, Harold, Muscatine, Muscatine
Wiggins, C. A., Prairie City, Jasper
Wiker, N. H., Mable, *Minnesota*
Wilbur, Thomas, Eldon, Wapello
Willholt, Charles, Oskaloosa, Mahaska
**Wilkinson, Roger, Mason City, Cerro Gordo
**Will, John, Muscatine, Muscatine
Williams, C. W., Danville, Des Moines
Williams, David, Williamsburg, Iowa
**Williams, L. R., New Providence, Hardin
Williamson, Geo., Griswold, Lucas

Wilkinson, J. D., Rock Falls, Cerro Gordo
Wilkinson, T. D., Rock Falls, Cerro Gordo
Willis, George, Colfax, Jasper
Williams, Galen, Basco, *Illinois*
Wilson, A. D., St. Paul, *Minnesota*
Wilson, Dick, Stanhope, Hamilton
Wilson, Jennie R., South English, Keokuk
Wilson, Robert, Shannon City, Union
Wilson, Gerald, Des Moines, Polk
Wilson, E. E., Forrest City, Hancock
Winn, Lawrence, Creston, Adams
Winegar, R. E., Westgate, Fayette
Winegard, D., Illinois City, *Illinois*
Winegard, D., Jr., Ames, Story
Winslow, L. M., Belle Plaine, Benton
Wise, Glenn, Gladbrook, Tama
Wise, L. O., Clinton, Clinton
Wolden, B. O., Wallingford, Emmett
Wolfe, C. J., Ainsworth, Washington
Wolf, Dean, Boxholm, Boone
Wohlers, Theo., Mo., Valley, Pottawattamie
Woodruff, J. A., Des Moines, Polk
Woods, T. A., Ames, Story
Wordhausen, J. H., Manson, Calhoun
Wornstaff, M. F., Altoona, Polk
Ward, Reiser, Oelwein, Fayette
Worster, S. A., Dode, Humboldt
Wortman, R. W., Ames, Story
Wreninger, Harry, Stanhope, Hamilton
Wright, F. J., Des Moines, Polk
Wright, W. E., Bedford, Taylor
Yager, Earl, Woodbine, Harrison
Yeager, C. R., Lavinia, Calhoun
Yager, Floyd, Woodbine, Harrison
Yingst, W. F., State Center, Marshall
Yocum, Vincent, Terrill, Dickinson
Young, Leslie, Stratford, Hamilton
Youngblood, L. E., Churdan, Greene
Yoke, R. C,. Allerton, Wayne
Yonker, A., Sioux City, Sioux
Young, Frank, West Bend, Palo Alto
Young, Mark, Gravity, Taylor
Yungst, W. Y., State Center, Marshall
Zerber, J. M., Sioux Rapids, Clay
Zunkel, Galard, Boxholm, Boone

## Juniors

| *Name and Town* | *County* |
|---|---|
| Ablett, Alfred, Ankeny, | Polk |
| Abraham, Mabel, Cambridge, | Story |
| Abuhl, Marvel, Ankeny, | Polk |
| Adams, William, Nichols, | Muscatine |
| Aiton, Mrs. A. T., Bedford, | Taylor |
| Aiton, Bruce, Bedford, | Taylor |
| Albright, Maurice, Ankeny, | Polk |
| Aldrich, Floyd, Waukee, | Dallas |
| Allen, Harold, Laurens, | Pocahontas |
| Allen, Wilmot, Laurens, | Pocahontas |
| Allison, Lucille, Des Moines, | Polk |
| Anderson, Anthon, Lanyon, | Webster |
| Anderson, Frances, Paton, | Greene |
| Anderson, Leland, Fenton, | Kossuth |
| Anderson, Linnea, Harcourt, | Webster |
| Apland, Clara, Cambridge, | Story |
| Apland, Edythe, Cambridge, | Story |
| Arend, Marcus, Fenton, | Kossuth |
| Arp, Alvin, Eldridge, | Scott |
| Auld, Lawrence W., Fremont, | Wapello |
| Austin, Hollis, Agency, | Wapello |
| Averhoff, Geo., Waterloo, | Black Hawk |
| Avery, Bert, Mason City, | Cerro Gordo |
| Bakkum, Glenn, A, Halfa, | Emmet |
| Barber, Dale, Kirkman, | Shelby |
| Barker, Frank, Red Oak, | Montgomery |
| Barker, Marshall, Osage, | Mitchell |
| Barr, Teddy, Storm Lake, | Buena Vista |
| Barstad, Chester, Linn Grove, | Buena Vista |
| Baumgardner, Clyde, McCallsburg, | Story |
| Beach, Ralph, Oskaloosa, | Mahaska |
| Beckman, Wilbur, Logan, | Harrison |
| Bence, Mildred, Collins, | Story |
| Bennington, Lovenia, Long Point, | *Illinois* |
| Benson, Denman, Macksburg, | Madison |
| Bentley, O. R., Dow City, | Crawford |
| Berglund, Wallace, Stanton, | Montgomery |
| Berry, Wm. J., Mason City, | Cerro Gordo |
| Berven, Theodore, Halfa, | Emmet |
| Biery, Alta, Ankeny, | Polk |
| Bishop, Merit H., Rudd, | Floyd |
| Bitterman, Rue, Nora Springs, | Cerro Gordo |
| Bivens, Raymond, Albion, | Marshall |
| Black, Elvie, Des Moines, | Polk |
| Blaine, Glenn A., Cedar Rapids, | Linn |
| Blake, John, Waukee, | Dallas |
| Bliss, Edith C., Ankeny, | Polk |
| Bond, C. W., Osage, | Mitchell |
| Bond, Wilford, Colfax, | Jasper |
| Bouck, Wayne, Mason City, | Cerro Gordo |
| Brand, Elmer Ankeny, | Polk |
| Braun, Roy, Nichols, | Muscatine |

| *Name and Town* | *County* |
|---|---|
| Brecher, Clare, Alta, | Buena Vista |
| Broerman, Herman, Oskaloosa, | Mahaska |
| Bronson, Walter, Bancroft, | Kossuth |
| Brown, Earl, Stratford, | Hamilton |
| Bruner, Fred A., Clearfield, | Taylor |
| Buchanan, Frank, Ottumwa, | Wapello |
| Buchanan, W. A., Marshalltown, | Marshall |
| Buckland, Earl R., Mapleton, | Monona |
| Bull, Fred, Ottumwa, | Wapello |
| Bull, Rex, Ottumwa, | Wapello |
| Bunch, Clifford, Laurens, | Pocahontas |
| Burk, Ralph, Waterloo, | Black Hawk |
| Burns, John, Charles City, | Floyd |
| Burnside, Marvin, Muscatine, | Muscatine |
| Burris, Gordon, Des Moines, | Polk |
| Bush, Geo. H., Plover, | Pocahontas |
| Butler, Morris, Marshalltown, | Marshall |
| Buwalda, John J., Pella, | Marion |
| Byers, Lawrence, Spirit Lake, | Dickinson |
| Byrnes, Darwin, Bagley, | Greene |
| Cable, John, Waterloo, | Black Hawk |
| Campbell, Arden, Lucas, | Lucas |
| Cargill, Herman, Halfa, | Emmet |
| Carlson, Donald, Lanyon, | Webster |
| Carlson, Vernon, Lanyon, | Webster |
| Carpenter, Ersell, Center Point, | Linn |
| Carpenter, Oral, Iowa Falls, | Hardin |
| Carrick, Beryl, Bagley, | Guthrie |
| Carrick, Harold, Bagley, | Guthrie |
| Carter, Orville D., Defiance, | Shelby |
| Chalstram, Harold, Spirit Lake, | Dickinson |
| Christenson, Clarence, Botna, | Shelby |
| Christian, Hansell, Roland, | Story |
| Christion, Marion, Nevada, | Story |
| Clark, Lucy, West Bend, | Palo Alto |
| Clayton, Donald, Waukee, | Dallas |
| Clements, Lyle, Grimes, | Polk |
| Clough, Eugene, Kellerton, | Ringgold |
| Coddington, Carlos J., Smithland, | Woodbury |
| Combs, Dale, New Market, | Taylor |
| Conkel, Damie, Ankeny, | Polk |
| Cook, Harold, Elwood, | Clinton |
| Cook, Hazel, Cambridge, | Story |
| Cook, Oliver, Dow City, | Crawford |
| Coon, Maxine, Charles City, | Floyd |
| Corkery, Richard, Wadena, | Fayette |
| Cornwell, Margaret, Ankeny, | Polk |
| Crow, Lloyd, L., Oxford, | Johnson |
| Crow, Raymond, Oxford, | Johnson |
| Currans, Edmond, Ruthven, | Palo Alto |
| Curtis, Robert L., Chariton, | Lucas |
| Dahlen, Gilmen, Osage, | Mitchell |

Daniels, Forrest, Des Moines, Polk
Danielson, Ernest A., Villisca, Montgomery
Davidson, Mae, Ankeny, Polk
Davis, C. W., Jefferson, Greene
Davis, Sidney, Delmar, Clinton
Davis, Watson, Castana, Monona
Deahl, Earl E., Centerville, Appanoosa
Decker, Aug., Shell Rock, Black Hawk
DeJarnette, Pearl, Des Moines, Polk
Detlefsen, Frank, Central City, Linn
Devine, Leland, Stanton, Montgomery
Dewees, Martha, Whittier, Linn
Dickey, Wayne C., Waterloo, Black Hawk
Dickinson, W. A., Charles City, Floyd
Dixson, William, Ames, Story
Dodd, Myrna, Collins, Story
Donahue, James, Jesup, Black Hawk
Doonan, Robert W., Barnes City, Mahaska
Doymude, Freeda, Ankeny, Polk
Dugan, Earl, Braddyville, Page
Dungan, Myrtle A., Chariton, Lucas
Dunn, George E., Clarinda, Page
Dunn, Miller, Clarinda, Page
Duroe, Wm., Sioux Rapids, Buena Vista
Dyke, Lyle, Hepburn, Page
Early, Zella, Cambridge, Story
Eastly, Mildred L., Ankeny, Polk
Easton, John, St. Anthony, Marshall
Edaburn, Marie, Toddville, Linn
Edaburn, Orval, Toddville, Linn
Edmonds, Carl, Laurens, Pocahontas
Edwards, V. A., Clarksville, Butler
Elder, Irvin, Fort Dodge, Webster
Eldredge, John C., Estherville, Emmet
Elliott, Earl, Sidney, Fremont
Elliott, Lowell, Sidney, Fremont
Ellis, Howard, State Center, Marshall
Ellis, Merrill D., Grimes, Polk
Emmons, Allan, Robins, Linn
Emmons, Floyd, Marion, Linn
Engel, Wilbert H., Palo, Linn
Erickson, Arnold, Story City, Story
Erwin, William, Marion, Linn
Everatt, William, Low Moor, Clinton
Evertsen, Hillman B., Le Grand, Marshall
Fahrenkrog, Elmer, Logan, Harrison
Farrington, Gladys, Silver City, Mills
Fausch, Bertha, Cambridge, Story
Felt, Earl, Waukee, Dallas
Fendrich, John, Arcadia, Carroll
Ferris, Rose, Clarinda, Page
Fiscus, Leland, Albion, Marshall
Fleming, Robert H., Dysart, Tama
Flynn, Leo, Fenton, Kossuth
Frauenholz, Roy, West Branch, Cedar
Freetly, Velma M., Rockwell City, Calhoun
Fuller, F E., Cedar Falls, Black Hawk
Ganoe, Effie, Sloan, Woodbury
Ganoe, Esther, Sloan, Woodbury
Gardner, L C., Fenton, Kossuth
Gardner, R L., Ottumwa, Wapello
Garrett, Wayne, Braddyville, Page
Garton, Ross E., Marathon, Buena Vista
Gaumer, Wayne, Hopeville, Clark
Geddes, Donald, Maxwell, Polk
Geil, Robert, Des Moines, Polk
Gibson, James F., Hudson, Black Hawk
Gibson, Loran, Grimes, Polk
Gibson, Vernon C., Clarinda, Page
Gilchrist, James, Walker, Linn
Gillett, Glenn, New Market, Taylor
Gilmore, George Ivan, Marion, Linn
Glenn, Jess, Mitchellville, Polk
Glover, Lester, Blakesburg, Wapello
Goemaat, Abraham, Tracy, Marion
Goldizen, Mae, Knoxville, Marion
Good, Emma, Ankeny, Polk
Goodwin, Floyd, Missouri Valley, Harrison
Gormly, Alan, Mt. Vernon, Linn
Gosselink, John H., Pella, Marion
Goughnour, Fay, Ankeny, Polk
Goughnour, Fern, Ankeny, Polk
Goughnour, Orma, Ankeny, Polk
Grace, Nelle, Des Moines, Polk
Grassmeier, Will, Bagley, Guthrie
Gray, George, Kanawha, Hancock
Griffith, Orland, Mapleton, Monona
Grimm, Florence, Cambridge, Story
Grimsley, Madeline, Ottumwa, Wapello
Groh, Wilhelmiene, Illinois, Adams
Groth, Clarence, Ames, Story
Gustafson, Joseph, Marathon, Buena Vista
Halden, Albert, Indianola, Warren
Hallowell, Esther, Ankeny, Polk
Hamm, Russell R., Marathon, Buena Vista
Hammerly, Carroll, Newton, Jasper
Harbaugh, Kenneth, Jefferson, Greene
Harem, Tilman W, Le Grand, Marshall
Harlan, Harold, Ottumwa. Wapello
Harpole, James, Patterson, Madison
Harrop, Russell, Des Moines, Polk
Hastings, Burr F., Plainfield, Bremer
Hauser, Jim, Albion, Marshall
Hauser, Linus, Spirit Lake, Dickinson
Hauser, Willard, Albion, Marshall
Hays, Margaret, Dallas Center, Dallas
Heefner, Darwin, Marion, Linn
Heefner, Spencer, Marion, Linn
Helm, Hubert, Nora Springs, Floyd
Henrichsen, Peter Denison, Crawford
Henry, Lyle, Farson, Wapello
Henry, Otis J., Cedar Falls, Black Hawk
Herkelmann, Waldo, Elwood, Clinton
Hewitt, Mabel, Ottumwa, Wapello
Hicks, Perle, Grand Mound, Clinton
Hill, Darrell, Odebolt, Sac
Hill, Donald W, De Witt, Clinton
Hill, Glenn T., Low Moor, Clinton
Hirsch, Carl, Ankeny, Polk
Hirsch, Edgar, Polk, Polk
Hitchcock, Beulah, Ankeny, Polk
Hitz, Clara, Ankeny, Polk
Hoffman, Karl, Ida Grove, Ida
Hoker, Gertrude, Wheatland, Iowa
Holden, Glen, Riceville, Mitchell
Hollenbeck, Edith, Eldon, Wapello
Hollenbeck, Josephine, Eldon, Wapello
Holliday, W. B., Pocahontas, Pocahontas
Hollingsworth, J. E., West Branch, Cedar
Holmes, Harold, Muscatine, Muscatine
Holmes, Paul, Des Moines, Polk
Holroyd, Paul, Waukee, Dallas
Hoover, Bess, Robins, Linn
Hopkins, E N, Des Moines, Polk
Horne, Joe, Redding, Ringgold
Hough, Ruth B., Council Bluffs, Pottawattamie
Houghton, Dorothy, Albion, Marshall
Houlihan, Vincent, Denison, Crawford
Hultman, Reuben, Blakesburg, Wapello
Huntley, Clifford, Halfa, Emmet
Hutton, Robert, Marion, Linn
Iehl, Orlin R., Walker, Linn
Ihle, Amund, Slater, Story
Ives, Robert, Danbury, Woodbury
Jackson, Rodney, Bagley, Guthrie
Jacobs, Harvey, West Bend, Palo Alto
Jandl, Frank, West Bend, Palo Alto
Jenison, Chloe, Belmond, Wright
Jensen, Lillian, Grand Mound, Clinton
Jewert, Martin, Elma, Howard
Johnson, Alfred, Ankeny, Polk
Johnson, Cecil H., Stratford, Hamilton
Johnson, Mayer, Story City, Story
Johnson, Maynus, Lanyon, Webster
Johnson, N. H., Storm Lake, Buena Vista
Johnson, Oliver, Blakesburg, Wapello
Johnson, Rudolph, Cherokee, Cherokee

Johnston, Vernon, Fonda, Pocahontas
Jorgensen, Arnold, Halfa, Emmet
Jorstad, Otis M., McCallsburg, Story
Justice, Glenn, Ankeny, Polk
Justice, Harold, Ankeny Polk
Kanneberg, Olive, De Witt, Clinton
Kappner, Alice, Quincy, Illinois
Kelderhouse, Clara, Collins, Story
Kelsey, Donald, Ottumwa, Wapello
Kelsey, Howard, Ottumwa, Wapello
Kelsey, Roderick, Ottumwa, Wapello
Kenagy, Bruce, Clarinda, Page
Kenig, Mabel, Collins, Story
Kendrick, Alfred, Floris, Davis
Kenny, Ralph, Bronson, Woodbury
Kepler, William, Cedar, Linn
King, Harlan E., La Porte City, Black Hawk
Kinney, Harold, Bondurant, Polk
Kinney, Lee, Bondurant, Polk
Klein, Mina, Council Bluffs, Pottawattamie
Knapp, Keith, Westfield, Plymouth
Knapp, Ward, Westfield, Plymouth
Kness, Ralph, Hamlin, Audubon
Kobi, Lester, Ankeny, Polk
Kollman, Cora, Rudd, Floyd
Krejie, Louis J., Cedar Rapids, Linn
Kristensen, Alfred, Hudson, Black Hawk
Lait, Russell, Ankeny, Polk
Langham, Roy, Elwood, Clinton
Lanning, Bessie, Gilmore City, Pocahontas
Larsen, Helen, Council Bluffs, Pottawattamie
Larsen, Hilmer, Wallingford, Emmet
Lauman, John, Rodman, Palo Alto
Leahy, Melvin, Denison, Crawford
Leighton, Rae, Sioux Rapids, Buena Vista
Lesan, Dee, Albion, Marshall
Lewis, Donald, Somers, Calhoun
Lewis, Harold Ankeny, Polk
Lewis, Joy, Kirkman, Shelby
Lewison, Lawrence, Sioux Rapids, Van Buren
Lindgren, Regina, Lanyon, Webster
Lister, Raymond, Hepburn, Page
Lofshult, Lillian, Sloan, Woodbury
Lofshult, Ruth, Sloan, Woodbury
Logan, Noah, Roland, Story
Logue, Flave, Estherville, Emmet
Loonan, George, Waterloo, Black Hawk
Lundgren, Clarence, Lundgren, Iowa
Luse, Chub, Mapleton, Monona
Lutgen, Mike, Waterloo, Black Hawk
Lynch, Floyd, Eldon, Wapello
Manning, Delbert, Nora Springs, Mitchell
Mast, Trueman, Ottumwa, Wapello
Masters, Tom, Mapleton, Monona
Mathis, Ethel, Ankeny, Polk
Mathre, J. E., Ames, Story
Matzen, Paul H., Mason City Cerro Gordo
McAllister, Sidney, Rome, Henry
McArthur, Arthur, Mason City, Cerro Gordo
McBride, Beulah, Polk, Polk
McCleary, Glee, Batavia, Jefferson
McClure, Carlyle, Barnes City, Mahaska
McConnell, R. E., Somers, Calhoun
McCoye, Raymond M., Council Bluffs, Pottawattamie
McCulloh, Winnie C., De Witt, Clinton
McDowell, Jane, Kirkman, Shelby
McGovern, Edna, Ankeny, Polk
McGovern, Terrence, Anamosa, Jones
McHenry, Charles, Dow City, Crawford
McHugh, Blanche, Rockwell City, Calhoun
McIntire, Vincent, Clarinda, Page
McMahon, Ralph, Rockwell City, Calhoun
McManus, Alma, De Witt, Clinton
McManus, Esther, De Witt, Clinton
McPherson, Kenneth, Des Moines, Polk
Meekley, Clifford, Colfax, Jasper
Meneough, Edward, Grimes, Polk
Middleton, Talford, Eagle Grove, Wright
Miller, M. June, West Bend, Palo Alto
Miller, Ross E., Clarinda, Page
Miller, V. C., Cedar Rapids, Linn
Mills, Ralph, Coggon, Linn
Mitchell, Iza, Keokuk, Lee
Mitchell, J. O., Des Moines. Polk
Mitchell, Lolita, Des Moines, Polk
Mohn, Vida, Lisbon, Linn
Moody, Chris, Muscatine, Muscatine
Moore, Collis E., Villisca, Page
Moore, Vasil, Somers, Calhoun
Morell, Max, Colo, Story
Morey, Irvin, West Bend, Palo Alto
Morgan, LeRoy S., Kirkman, Shelby
Mosher, George, Riceville, Mitchell
Moss, Robert, E., Riceville, Mitchell
Mullenix, Wilber, Ottumwa, Wapello
Myklebust, Elmer, Halfa, Emmet
Nabholz, Franklin, Brandon, Linn
Naughton, Walsh, Denison, Crawford
Naylor, Ivyl E., Stratford, Hamilton
Nelson, Alden, Stanton, Montgomery
Nelson, Ernest, Exira, Audubon
Nelson, Garland, Exira, Audubon
Nelson, Harry, Halfa, Emmet
Nichols, Edwin, Clear Lake, Cerro Gordo
Nissen, Ralph, Lyons, Clinton
Nollen, Marion, Pella, Marion
Nyce, Walter, Liscomb, Marshall
Oliver, Clifford, Redding, Ringgold
Oliver, Ora, Ottumwa, Wapello
Olson, Burton, Ames, Story
Olson, Mae, Kirkman, Shelby
Olson, Myron, Osage, Mitchell
Olson, Ole N., Calamus, Clinton
Olson, Sanford, Story City, Story
Orth, Hazel, E., Des Moines, Polk
Ostergaard, Thyra, Camanche, Clinton
Overmyer, R. M., Sioux Rapids, Buena Vista
Owen, Hobart, Clarinda, Page
Pace, Virgil, New Market, Taylor
Parrett, Fred, Floris, Davis
Parrett, Marjorie, Floris, Davis
Parsons, Eloise P., Clarinda, Page
Parsons, Ruth, Clarinda, Page
Patro, Kenneth, Prairie City, Jasper
Patterson, Dean, Coin, Page
Patton, Robert, Council Bluffs, Pottawattamie
Paulson, Franklin, Story City, Story
Pellett, Kent, Atlantic, Cass
Peter, Esther, M., Center Point, Linn
Peterson, Jeffrey, Roland, Story
Peterson, Joseph, Lake Mills, Winnebago
Peterson, Kenneth, Dolliver, Emmet
Phelps, Signa, Harlan, Shelby
Pinkerton, John, Albert City, Buena Vista
Pinkerton, Lyle, Albert City, Buena Vista
Pittgen, Francis, Dallas Center, Dallas
Powell, Elliott, Rockwell City, Calhoun
Price, LeRoy, Grundy Center, Grundy
Purdy, Frankie, Fontanelle, Adair
Purvience, O. Keith, Minburn, Dallas
Randolph, Bessie, Ankeny, Polk
Randolph, Floyd, Grimes, Polk
Randolph, Mary, Ankeny, Polk
Rankins, Johnnie J., Cherokee, Cherokee
Raper, Vernon, Casey, Adair
Rasmusson, Benford, Roland, Story
Reedholm, Violet, Lanyon, Webster
Reuland, Frank, Albert City, Buena Vista
Rickey, Farrel, Winfield, Henry
Riley, Donald, Chillicothe, Wapello
Rinden, Freda, Albion, Marshall
Risser, Clay K., Danville, Des Moines
Rohden, Delphie, Harcourt, Webster
Rohden, Melville, Lanyan, Webster
Rooker, Doris, Mitchellville, Polk
Rosenan, Lloyd, I., Germania, Kossuth
Ross, John F., Jr., Rockwell City, Calhoun

Ross, Opal D., Des Moines, Polk
Rupl, Emerson, Ottumwa, Wapello
Russell, Murray, Newton, Jasper
Ryon, Lester, Laurens, Pocahontas
Saar, Harvey, Treynor, Pottawattamie
Saar, Roy, Treynor, Pottawattamie
Sajka, Claude, Riverside, Washington
Sampson, F. C., Audubon, Audubon
Sargent, Leta, Ankeny, Polk
Sargent, Mildred, Ankeny, Polk
Sargent, Ray, Ankeny, Polk
Satterthwaite, Maynard, Muscatine, Muscatine
Satterthwaite, Raymond, Muscatine, Muscatine
Sauer, Margaret, Council Bluffs, Pottawattamie
Sauer, Samuel, Hedrick, Wapello
Sautell, Wayne, Danville, Des Moines
Sayles, Burl C., West Branch, Cedar
Schild, Vern, Hawarden, Iowa
Schmid, Ulrich J., Kirkman, Shelby
Schmitz, Albert, Remsen, Plymouth
Schmitz, Louis, Remsen, Plymouth
Schrank, Simon, Danbury, Woodbury
Schroeder, Ralph, Waterloo, Black Hawk
Schwartz, H. L., Albion, Marshall
Scott, Harold, Marion, Linn
Scott, Jay, Marion, Linn
Seaton, Dwight, Danville, Des Moines
Seaton, G. Leland, Danville, Des Moines
Seiberling, Richard, Mitchellville, Polk
Selim, Paul, Lanyon, Webster
Severied, Merrill, Story City, Story
Severns, Don, Harlan, Shelby
Shanks, Leonard, Mason City, Cerro Gordo
Shannon, Paul, Waukee, Dallas
Shannon, Roy, Estherville, Emmet
Sheia, Sylvian, Story City, Story
Sheley, Dora M., Herbert, *Illinois*
Shepard, Lester, Onawa, Monona
Shepherd, Harold, Ottumwa, Wapello
Sheppard, Florence, Ankeny, Polk
Sherwin, Rollin R., Council, Bluffs, Pottawattamie
Shields, Loleta, Clarinda, Page
Shupe, Vera, Woodburn, Clarke
Simpson, Maggie, Cambridge, Story
Simpson, Marie, Cambridge, Story
Sesker, Burnice, Cambridge, Story
Skirvin, John, Agency, Wapello
Smith, Claude, Ankeny, Polk
Smith, Homer, Halfa, Emmet
Smith, Virgil, Ankeny, Polk
Sheller, Jack, Sumner, Bremer
Snook, Verne, Newton, Jasper
Soenke, Katie, Walcott, Scott
Soorholtz, Howard, Melbourne, Marshall
Speas, Carl, Montezuma, Poweshiek
Spiker, Roy, Chariton, Lucas
Sposeto, Patrick, Glenwood, Mills
Spurrier, L. H., Macoun, *Sask., Can.*
Steadman, Marvin, Ames, Story
Stensrud, Elmer, Lake Mills, Winnebago
Stephenson, Earl R., Lanyon, Webster
Sterner, Loren, Agency, Wapello
Stevens, Chester D., West Bend, Palo Alto
Stevenson, C. W., West Bend, Palo Alto
Stevenson, Lynn, Elma, Howard
Stock, Orion, Denison, Crawford
Stoelting, Edwin, Schaller, Sac
Stratton, Mildred, Collins, Story
Streicker, Thomas, Chillicothe, Wapello
Surfus, Lyle, Bristow, Butler
Swanson, Ernest, Red Oak, Montgomery
Swanson, Harold, Stanton, Montgomery
Swartfager, Florence, Ankeny, Polk
Sylvester, Edith, Council Bluffs, Pottawattamie
Sylvester, Mrs. E. H., Council Bluffs, Pottawattamie
Taber, Clifford, Springville, Linn
Taber, Marion, Springville Linn
Tague, Clifford, Kirkman, Shelby
Talbot, Verne, Newton, Jasper
Taube, Lloyd, Marion, Linn
Templeton, William, Riceville, Mitchell
Tharp, Fred, La Porte City, Black Hawk
Thomas, Clarance, Eldon, Wapello
Thomas, Dale, Winterset, Madison
Thomas, Elijah, Eldon, Wapello
Thomas, Ione, Kensett, Worth
Thomas, Lauren, Dow City, Crawford
Thomas, Wilber, Eldon, Wapello
Thompson, Albert, Lake Mills, Winnebago
Thompson, Tilmen, Leland, Winnebago
Thornton, James, Ames, Story
Thorsbakker, Otis, Story City, Story
Tracy, Josephine, Collins, Story
Tracy, Julia, Collins, Story
Tramel, Howard, Mingo, Jasper
Twedt, Otis, Roland, Story
Van Benthurjsen, H. H., Ankeny, Polk
Vander Kamp, William, Newton, Jasper
Van Zante, Albert, Pella, Marion
Van Zee, A. G., Pella, Marion
Vaughn, Walter, Marion, Linn
Wahl, Frederick S., Boone, Boone
Walker, Minna, Pleasantville, Marion
Walton, Ralph, Council Bluffs, Pottawattamie
Ward, Frank, Cedar, Mahaska
Warner, Gerald, Blakesburg, Wapello
Watts, Pressley R., Des Moines, Polk
Waugh, Lionel, Spirit Lake, Dickinson
Webber, Othello, Spirit Lake, Dickinson
Weir, David, Estherville, Emmet
Wenos, Amelia, Cambridge, Story
Wetherbee, Paul R., Central City, Linn
Wheeler, Fannie L., De Witt, Clinton
White, Harold A., Rhodes, Marshall
White, Raymond, Springville, Linn
White, Virgil J., Springville, Linn
Whitehead, Leon J., Des Moines, Polk
Whitehill, Donald, Clarinda, Page
Whittum, Mrs. Mina, Greenfield, Adair
Wierson, Theroy, Story City, Story
Wiggers, Harold, Muscatine, Muscatine
Wilcox, Walter, Wyoming, Jones
Wilkinson, Roger, Mason City, Cerro Gordo
Will, John, Muscatine, Muscatine
Willcoxon, Charlie, Winterset, Madison
Williams, Rosetta, West Bend, Palo Alto
Williams, Waldo, Ankeny, Polk
Williamson, George Jr., Williamson, Lucas
Williamson, Ralph, Chariton, Lucas
Willman, Beatrice, Cedar Rapids, Linn
Wilson, Clifford, Newton, Jasper
Wilson, Leland, Des Moines, Polk
Witmer, Adolph, Mason City, Cerro Gordo
Woldruff, Cecil, Braddyville, Page
Woods, Arthur, Estherville, Emmet
Woods, Charles A., Ankeny, Polk
Woods, Nelma, Cambridge, Story
Woods, R. C., West Branch, Cedar
Wray, George, Riceville, Mitchell
Wright, Eugene, Palo, Linn
Wright, Jesse, Charles City, Floyd
Wright, Leonard, Belle Plaine, Benton
Wyatt, Vernon, Des Moines, Polk
Young, Leslie, Stratford, Hamilton
Zook, Clarence, Clear Lake, Cerro Gordo
Zook, Gladyce, Cambridge, Story

## In Home Economics

| *Name and Town* | *County* |
|---|---|
| Achter, Mrs. H. J., Cedar Rapids, | Linn |
| **Aiton, Mrs. A. T., Bedford, | Taylor |
| Albert, Mrs.,, Ames, | Story |
| Allen, Mary F., Indianola, | Warren |
| Allend, Leta, Gladbrook, | Tama |
| Altercras, Mrs., Muscatine, | Muscatine |
| Anderson, Edith, Boxholm, | Boone |
| **Anderson, Francis, Paton, | Greene |
| **Anderson, Linnea, Harcourt, | Webster |
| Anderson, Margaret, Boxholm, | Boone |
| Andrews, Laura, Des Moines, | Polk |
| Angell, Mrs. Etta, Ames, | Story |
| Anthony, Mrs. C. H., Ames, | Story |
| Apland, Mrs. Peter, Cambridge, | Story |
| Archer, Mrs. J. W., Rockwell City, | Calhoun |
| Arp, Roma, Eldridge, | Scott |
| Ashby, Mrs. N. B., Des Moines, | Polk |
| Augustin, Mrs. H., Orient, | Adair |
| Bakley, Bertie, Boxholm, | Boone |
| Bakley, Linda, Boxholm, | Boone |
| Baldwin, Dora, Grundy Center, | Grundy |
| Barrows, Anna, Washington, | *D. C.* |
| Baxter, Lillie, Galve, | Ida |
| Beisell, Mrs. D. W., Goldfield, | Wright |
| Bell, Mrs. S. J., Ames, | Story |
| Bennett, Mrs. Ray, Ames, | Story |
| **Bennington, Lovenia, Long Point, | *Illinois* |
| Bentley, Mrs. Lillie, Ames, | Story |
| Bentley, Mrs. Russell, Dow City, | Crawford |
| Berglung, Minnie, Stratford, | Hamilton |
| *Beyer, Mrs. Jennie, Ames, | Story |
| Bickelhaupt, Emma, Story City, | Story |
| Bigelow, Mrs. W. T., Salix, | Woodbury |
| Birkley, Mrs. A. J., Boone, | Boone |
| Bishop, Mrs. L. H., Rudd, | Floyd |
| Blaire, Mrs., Gilman City, | Marshall |
| Bliss, Mrs. R. K., Ames, | Story |
| Bobo, Mary, Nevada, | Story |
| Bohling, Dorothy, Rinard, | Calhoun |
| Boyland, Maude, Manchester, | Delaware |
| Brabons, Clara, Cumberland, | Cass |
| Brekky, Julia, De Witt, | Clinton |
| Brod, Nellie, Boxholm, | Boone |
| Brown, Mrs. Gates M., Ames, | Story |
| Brown, Mrs. LeRoy, Chicago, | *Illinois* |
| Brownell, Mrs. F. D., Winterset, | Madison |
| Brownson, Mrs. H. C., McGregor, | Clayton |
| Brubaker, Reba, Prairie City, | Jasper |
| Burke, Mrs. B., Rockwell City, | Calhoun |
| Burke, Elizabeth, Ruthven, | Palo Alto |
| Burling, Helen, Mason City, | Cerro Gordo |
| Burton, Effie, Cedar Rapids, | Linn |
| Cafferty, Lois, Rinard, | Calhoun |
| Campbell, Jessie, Des Moines, | Polk |
| Camreon, Ada, Ames, | Story |
| Carlson, Dora, Boone, | Boone |
| Carlson, Edna, Lanyon, | Webster |
| *Carlson, Elsie, Ames, | Story |
| Carlson, Ida, Slater, | Story |
| Carlson, Ruth, Stanhope, | Hamilton |
| Carpenter, Ersill, Kenwood Park, | Linn |
| Carpenter, Ora, Iowa Falls, | Hardin |
| Carson, Mrs. E. C., Woodburn, | Clarke |
| Carter, Mrs. D. G., Ames, | Story |
| Case, Verdella, Des Moines, | Polk |
| Case, Mrs. F. A., Des Moines, | Polk |
| Chambers, Marie, Des Moines, | Polk |
| Chestnut, Mrs. G. R., Ames, | Story |
| Christian, Mamie, Roland, | Story |
| Christian, Marion, Roland, | Story |
| Clampitt, Edith, New Providence, | Hardin |
| Clark, Mrs. Ella D., Ames, | Story |
| **Clark, Lucy, West Bend, | Palo Alto |
| Clark, Mrs. M. L., Clarion, | Wright |
| Cockerill, Mrs. C. G., Jefferson, | Greene |
| Coddington, Mrs. F., Smithland, | Woodbury |
| Colburn, Mrs. Fred, Ames, | Story |
| Conklin, Mrs. H. N., Ames, | Story |
| Conlin, Grace, Sioux City, | Woodbury |
| Conrad, Miss G., Nevada, | Story |
| Converse, Mrs. F. A., Harvey, | Marion |
| Conway, Faye, Casey, | Guthrie |
| **Coon, Maxine, Charles City, | Floyd |
| Copeland, Mrs. Jesse, Ames, | Story |
| Coverdale, Mrs. J. W., Ames, | Story |
| Cresswell, Eva, Independence, | Buchanan |
| Cromwell, Mrs. John, Ames, | Story |
| Davis, Mrs. A. H., Castana, | Monona |
| Dean, Mrs.A. H., Ames, | Story |
| Dean, Edna, Ames, | Story |
| Dean, Mrs. H. C., Sanborn, | O'Brien |
| Decker, Ruth, Rinard, | Calhoun |
| De Jarnette, Pearl, Des Moines, | Polk |
| Derby, Emma B., Nevada, | Story |
| Derby, Lydia, Nevada, | Story |
| Derby, Mable, Story City, | Story |
| Derby, Stella, Nevada, | Story |
| *De Weis, Martha, Whittier, | Linn |
| Dinesen, Mrs. A. A., Harlan, | Shelby |
| Dodge, Mrs, H. K., Des Moines, | Polk |
| Dolliver, Mrs. Jonathan, Ft. Dodge, | Webster |
| Donlin, Mrs. W. J., Castana, | Monona |
| Dorfler, Mrs. Edith, Charter Oak, | Crawford |
| Dredger, Vera H., Des Moines, | Polk |
| Dunlap, Mrs. Eva, Ames, | Story |
| Dunnigan, Myrtle, Chariton, | Lucas |
| **Ediburn, Marie, Toddville, | Linn |
| Edwards, Mrs. R. M:, Des Moines, | Polk |
| Effler, Mrs., Ames, | Story |
| Elder, Mrs. D. I., Ft. Dodge, | Webster |
| Enburg, Mrs. Wm., Stanhope, | Hamilton |
| Erickson, Francis, Boxholm, | Boone |
| Erickson, Mrs. J. M., Slater, | Story |
| Ersland, Minerva, Slater, | Story |
| Euken, Emma, Wiota, | Cass |
| Euken, Frieda, Wiota, | Cass |
| Euken, Louise, Wiota, | Cass |
| Evans, Mrs. Ottumwa, | Wapello |
| **Farrington, Gladys, Silver City, | Mills |
| **Ferris, Rose, Clarinda, | Page |
| Ferguson, Eva, Riverton, | *Wyoming* |
| Fisher, Dorothy A., Castana, | Monona |
| Fisher, Mrs Fred, Ames, | Story |
| Fisher, Miss Lillie, Ames, | Story |
| *Fleek, Ruth, Greene, | Butler |
| Fleming, Anna W., Ames, | Story |
| Fleming, Mable, Ames, | Story |
| Fleming, Mrs. W. R., Dysart, | Tama |
| Foster, Mrs., Muscatine, | Muscatine |
| Fowlie, Leila, Rinard, | Calhoun |
| Frandsen, Mrs. P. T., Eagle Grove, | Wright |
| Frank, Mrs. R. W., Renwick, | Humboldt |
| **Freetly, Velma, Rockwell City, | Calhoun |
| French, Mrs. C. A., Ames, | Story |
| French, Francis, Terrill, | Dickinson |
| French, Ruth, Ames, | Story |
| Fugett, Margaret, Thurman, | Fremont |
| **Ganoe, Esther, Sloan, | Woodbury |
| **Ganoe, Effie, Sloan, | Woodbury |
| Garton, Mrs. Frank, Marathon, | Buena Vista |
| Geertz, Mrs., Muscatine, | Muscatine |
| Gibbens, Ruby, Spencer, | Clay |
| Giese, Mrs. Henry, Ames, | Story |
| Gillette, Mrs. John, Clarinda, | Page |
| Gingles, Mrs. W. W., Castana, | Monona |
| **Goldizen, May, Knoxville, | Marion |
| Goodard, Emma, Bryant, | Clinton |
| Goodykoontz, Mrs. W. W., Boone, | Boone |
| Gosling, John, Kansas City, | *Missouri* |
| Graves, Mrs. A. V., Nevada, | Story |
| Gray, Edna, Albia, | Monroe |
| Gray, Elva, Albia, | Monroe |

Graydert, Jean, Bryant, Clinton
Gree, Miss, Boxholm, Boone
Green, Pearl, Burlington, Des Moines
Greene, Rose, Boxholm, Boone
Gregg, Mrs. Mary, Marshalltown, Marshall
Grodet, Eugenis, Bryant, Clinton
Grogan, Mrs. J. W., Ames, Story
Grok, Wilhemme, Payson, *Illinois*
Grossman, Mary Grace, Ames, Story
Gruwell, Mrs. A. C., Ames, Story
Gue, Jessie, Boxholm, Boone
Gue, Mrs. Ralph, Ames, Story
Gunderson, May, Cherokee, Cherokee
Gunderson, Nellie J., Cherokee, Cherokee
Guthrie, Mrs. A. T., Newton, Jasper
Hall, Luella, Colo, Story
Hammer, Mildred, Ames, Story
Hanson, Nettie, Eldora, Hardin
Harris, Eva, Nevada, Story
Hart, Ada Louis, Lohrville, Calhoun
Hason, Nettie R., Eldora, Hardin
Hastie, Mrs. Robert, Milford, *Sask., Can.*
Hastings, Bessie P, Iowa City, Johnson
Havel, Mamie, Ainsworth, Washington
Havel, Mayme, Ainsworth, Washington
Havenhill, Mrs Mark, Ames, Story
Hawks, Miss, Ames, Story
Haynes, Mrs. L. G, Des Moines, Polk
Haynes, Treva, Grimes, Polk
Heggen, Marjorie, Slater, Story
Hill, Ethel, Odebolt, Sac
Hinde, Mrs. A. H., Early, Sac
Hitchcock, Mrs Muscatine, Muscatine
Hitz, Dora. Ankeny, Polk
Hoffman, Mrs. A. E, Waterloo, Black Hawk
Hogan, Mrs., Gilman, Marshall
Holland, Beulah, Slater, Story
Holland, Lillian, Slater, Story
Honnold, Mrs C I, Slater, Story
**Hoover, Bess, Robins, Linn
Hopkins, Muriel, Ottumwa, Wapello
Hoskins, Mable, Wright, Mahaska
Hostetter, Fern, Nevada, Story
**Hough, Ruth, Council Bluffs, Pottawattamie
**Houghton, Dorothy, Albion, Marshall
Houser Mrs. Theo., Ames, Story
Hovde, Mable, Roland, Story
Hoversten, Mrs Ted, Jewell, Hamilton
Howe, Mrs. W. C., Cedar Rapids, Linn
Hoyer, Mrs C W., Ames, Story
Hughes, Mrs. H D., Ames, Story
Hunn, Miss F., Des Moines, Polk
Hunter, Mrs W. E., Audubon, Audubon
Husted, Olive M, Ames, Story
Husted, Mrs. S. A, Ames, Story
Hutchinson, Mrs. W C, Dawson, Dallas
Ihley, Mrs. Nels, Slater, Story
Ingersoll, Mrs, Ames, Story
Ingles, Mrs. J F, Melbourne, Marshall
Irwin, Mrs W. G, Marengo, Iowa
Isaacson, Elsie, Stratford, Hamilton
Jackson, Mary L., Nevada, Story
Jaegger, Mrs. Arnold, Omaha, *Nebraska*
Jenson, Alma, Van Meter, Dallas
Johnson, Christina, Story City, Story
Johnson, Isabell, Story City, Story
Johnson, Mrs E. D., Harlan, Shelby
Johnson, Naomi, Slater, Story
Jones, Mrs Chas, Rockwell City, Calhoun
Jones, Laura, Brookings, *South Dakota*
Jones, Louise, Atlantic, Cass
Jordan, Vivian, Davenport, Scott
Jorgeson, Lorena, Kimballton, Audubon
Jorgeson, Agnes, Kimballton, Audubon
**Kappnor, Alice, Quincy, *Illinois*
Kelley, Mary, Ames, Story
Kennedy, Mrs. Carl, Des Moines, Polk
Ketleson, Bertha, Lyons, Clinton
Klusmire, Gladys, Ames, Story
Kingsly, Margaret, Nevada, Story
Knapp, Hermine, Emmetsburg, Palo Alto
Knotck, Mamie, Riverside, Washington
Knotck, Mrs. Jo, Riverside, Washington
Kober, Emma E., Dysart, Tama
Korsland, Alice, Thor, Humboldt
Kramer, Esther, Waterloo, Black Hawk
Krue, Wilma, Wilton, Muscatine
Kunerth, Mary, La Crosse, *Wisconsin*
Kuefner, Agnes, Des Moines, Polk
**Lanning, Bessie, Gilmore City, Pocahontas
Laird, Adelaide, Des Moines, Polk
Lambe, Mary C., Ames, Story
Lanier, Mrs. Chas., Dayton, Webster
Largisser, Edith, Sioux City, Woodbury
Largisser, Edna, Sioux City, Woodbury
Larson, Carrie, Slater, Story
Larson, Mary, Slater, Story
Lawson, Dora, Orion, *Illinois*
Lawson, Laura, Sunnyhill, *Illinois*
Lawther, Anna B., Dubuque, Dubuque
Lease, Mrs. Roy, Galva, Ida
Leeka, Lorena, Thurman, Fremont
Lego, Mrs. A. M., Ames, Story
Lehman, Mrs. Alvin, Slater, Story
Lehman, Verena, Slater, Story
Leicht, Mrs. Harvey, Dyersville, Dubuque
**Lesan, Dee, Albion, Marshall
Levorson, Martha, Lake Mills, Winnebago
Lewis, Mrs L, Rockwell City, Calhoun
Lehrdahl, Mrs. A. T, Ames, Story
Lewis, Jeanette, Rockwell City, Calhoun
Lewis, Joy, Kirkman, Shelby
**Lindgren, Regina, Lanyon, Webster
Loomis, Mrs., Cedar Rapids, Linn
**Lofshault, Lillian, Sloan, Woodbury
**Lofshault, Ruth, Sloan, Woodbury
Lundberg, Mildred, Boxholm, Boone
Lundgren, Lollie, Lungren, Webster
Mackay, Miss Anna, Ames, Story
Mac Murray, Mrs. A. S., Oelwein, Fayette
Malley, Mrs. E. O., Ames, Story
Maloney, Mary, Nevada, Story
Marshall, Mary, Des Moines, Polk
Marston, Evelyn, Iowa City, Johnson
Martin, Mrs G. S., Ithaca, *New York*
Mason, Francis B., Boone, Boone
Mercer, Blanche, Tipton, Cedar
**McBride, Beulah, Polk City, Polk
*McBride, Minnie, Polk City, Polk
McConnough, Irene, Barnum, Webster
**McDowell, Jane, Kirkman, Shelby
**McHugh, Blanche, Rockwell City, Calhoun
*McKim, Genevieve, Kansas City, *Missouri*
McKisick, Lillian, Albia, Monroe
McKisick, Lilia, Albia, Monroe
McKune, Mrs W., Ames, Story
McLaughlin, Inez, Marathon, Buena Vista
McMurray, Mrs Murray, Wheeler, Webster
McNichols, Agnes, Nevada, Story
Mehler, Bertha, Des Moines, Polk
Meredith, Mrs C H, Searsboro, Poweshiek
Mervin, Mrs. E M, Ames, Story
Meyer, May, Van Meter, Dallas
Middleton, Mrs., Ames, Story
Middleton, Mrs. A. L., Eagle Grove, Wright
Miller, Mrs Catherine, Ames, Story
**Miller, June, West Bend, Palo Alto
Mitchell, Eila, Churdan, Greene
Mitchell, Eulah, Jefferson, Greene
**Mohn, Vida, Lisbon, Linn
Moore, Teressa, Ames, Story
Morgan, Mrs. Ethel Cessna, Manchester, Delaware
Morris, Mrs. E F., New Providence, Hardin
Morris, Mrs. Viola B, New Providence, Hardin
Mortensen, Mrs., Ames, Story

Mott, Mrs. H. A., Des Moines, Polk
Muhs, Elma, Eldridge, Scott
Muse, Mrs. W. F., Mason City, Cerro Gordo
Mussen, Mrs. Bertha, Ames, Story
Myers, Mrs. George, Ames, Story
Neal, Mrs. J. E., Ames, Story
Neffky, Louise, Farnhamville, Calhoun
Nelson, Leona, Slater, Story
Nelson, Virginia, Slater, Story
Neswanger, Catherine, Prairie City, Jasper
Neswanger, Neva, Prairie City, Jasper
Olsan, Beatrice, Ames, Story
Olsan, Theresa, Ames, Story
**Olsen, Mae, Kirkman, Shelby
Olsen, Nora, Boone, Boone
Osborn, Mrs. J. L., Ames, Story
Otto, Helen, Grimes, Polk
Otto, Mrs. I. E, Ames, Story
Owen, Blanche, Albia, Monroe
Pammel, Miss, Des Moines, Polk
Pammel, Mrs., Des Moines, Polk
*Parmerly, Helen, Iowa Falls, Hardin
Parrott, Mrs. W. F., Waterloo, Black Hawk
**Parsons, Ruth, Clarinda, Page
Patterson, Elsie, Stratford, Hamilton
Paul, Lillian, Thurman, Fremont
Pepper, Mrs. H.F, Ames, Story
**Peter, Esther, Center Point, Linn
Peterson, Edith, Gowrie, Webster
Peterson, Mabel, Boxholm, Boone
Pettitt, Opal, Oskaloosa, Mahaska
**Phelps, Signa, Harlan, Shelby
Pickerell, Mrs. M K., Eddyville, Wapello
Poyzer, Mrs. John, Spirit Lake, Dickinson
Price, Mrs. R. F, Ames, Story
Quum, Francis, Roland, Story
Redman, Mrs. John, Ft. Dodge, Webster
**Reedholm, Violet, Lanyon, Webster
Reinertson, Nettie, Slater, Story
Rice, Carrie, Boone, Boone
Richardson, Grace G., Clarion, Wright
**Rinden, Freda, Albion, Marshall
Ritland, Mrs. Carl, Rock Valley, Sioux
Rittgers, Mrs. T. D., Dallas Center, Dallas
Roberts, Mrs. W. T., Ames, Story
Robinson, Mrs. E. O., Ames, Story
Rockwood, Mrs. E. W., Iowa City, Johnson
Roe, Agnes, Kelley, Story
Rogers, Mrs. George, Ames, Story
**Rohden, Delphie, Harcourt, Webster
Rohnblom, Esther, Stanhope, Hamilton
**Rooker, Doris, Mitchellville, Polk
Rooks, Rachel, Lowden, Cedar
Root, Nellie, Rinard, Calhoun
Rose, Mrs. F. A, Ames, Story
Rougnebaugh, Nettie, Story City, Story
Rowley, Mrs. E. W, Ames, Story
Ruthland, Mrs. Carl, Rock Valley, Sioux
Rutledge, Mrs. Carrie, Ft Dodge, Webster
Sage, Mrs. E., Waterloo, Black Hawk
Sawin, Mrs H. W. M, Northwood, Wood
Sealine, Esther, Stanhope, Hamilton
Schenk, Mrs Beulah, Des Moines, Polk
Schmitz, Louis, Remsen, Plymouth
Schneckloth, Irma, Davenport, Scott
Schoeberlin, Hilda, Rinard, Calhoun
Scholten, Anna, Boyden, Sioux
Schwanz, Mrs. A I, Lorimor, Union
Scoville, Mrs., Ames, Story
Selim, Pearl, Paton, Greene
Severeid, Rhoda, Slater, Story
**Sheley, Dora, Herbert, *Illinois*
Shellabarger, Ruthetta, Letts, Louisa
**Shields, Loleta, Clarinda, Page
Schovennberger, Mrs. John, Winterset, Madison
**Shupe, Vera, Woodburn, Clarke
Sigler, Mrs. F. C., Indianola, Warren
Simpson, Mrs. B. O., Ames, Story
Skortman, Irma, Slater, Story
Skull, Mrs. William, Ames, Story
Slingerland, Mrs. C. E., Ames, Story
Smith, Etta, Gillett Grove, Clay
Smith, Mrs. K. G., Ames, Story
Smith, Ora E., Jefferson, Greene
Soenke, Ella, Walcott, Scott
Souder, Altie, Rockwell City, Calhoun
Soukey, Lillie, Farnhamville, Calhoun
Stanley, Mrs. Laura, Springville, Linn
Stanton, Mrs. E. W., Ames, Story
Stirdiman, Elsie, Clinton, Clinton
Stirdiman, Ida, Clinton, Clinton
Strand, Mrs. Emil, Newburg, Jasper
Style, Mrs. Harold, Ames, Story
Sutter, Clara, Cedar Falls, Black Hawk
Svenke, Katie, Walcott, Scott
Svenke, Lillie, Walcott, Scott
Swanson, Cecelia, Nevada, Story
Sweet, Bertha, Roland, Story
Swift, Mrs. Victor, Gilman, Marshall
Sydnes, Elnora, Slater, Story
**Sylvester, Mrs. E. H., Council Bluffs, Pottawattamie
Tabor, Marion, Springville, Linn
Taylor, Mrs. Henry C., Bloomfield, Davis
Teese, Miss, Boxholm, Boone
Thew, Mrs. T. H., Omaha, *Nebraska*
**Thomas, Ione, Kensett, Worth
Thompson, Alice E., Ames, Story
Thompson, Mrs. E., Ames, Story
Thompson, Henrietta, Polk City, Polk
Thompson, Mrs. J. H., Ringsted, Emmet
Thornburg, Mrs. D. G., Ames, Story
Tisdall, Clara, Cambridge, Story
*Tobin, Jewell, Burlington, Des Moines
Townsley, Lila, Letts, Louisa
Trotner, Grace, Des Moines, Polk
*Troutner, Edith, Keokuk, Lee
Tweet, Rosie, Roland, Story
Vanderwilt, Cynthia, Boyden, Sioux
Van Slyke, Hesler M., Des Moines, Polk
Wakefield, Maud, Nevada, Story
Walker, Marie, Slater, Story
**Walker, Mina, Pleasantville, Marion
Walkner, Mrs. Fred, Renwick, Humboldt
Walters, Mrs. E. V, Ames, Story
Warbis, Bessie, Rinard, Calhoun
Wardell, Ruth A, Iowa City, Johnson
Warrington, Mrs. C H., Jefferson, Greene
Warner, Viola, Ames, Story
Warren, Ethelwyn, Cedar Rapids, Linn
Warren, Glendolyn, Cedar Rapids, Linn
Warren, Marion, Cedar Rapids, Linn
Warts, Deaconess M H, Des Moines, Polk
Wasser, Mrs, Ames, Story
Watkins, Florence, Ames, Story
Watzek, Mrs, Davenport, Scott
Weaver, Louise Bennett, Des Moines, Polk
Weber, Mrs. Andrew H, Des Moines, Polk
Western, Mrs. C A., Beaconsville, Ringgold
Wheeler, Mrs Frank, Ontario, Story
**Whittum, Mrs. Mira, Greenfield, Adair
Whitley, Mrs. Francis E., Webster City, Hamilton
Whitney, Ada E., Cherokee, Cherokee
*Wiegmann, Gladys, Garner, Hancock
William, Beatrice, Cedar Rapids, Linn
Williams, Rosetta, West Bend, Palo Alto
Wills, Elva, Cambridge, Story
Wilson, Mrs. E B., Jefferson, Greene
Wilson, Mrs. Peter B, Bristow, Butler
Winegar, Mrs. R E., Westgate, Fayette
Wood, Clara, Des Moines, Polk
Wood, Ethel, Grimes, Polk
Wood, Mildred, Ft. Dodge, Webster
Wooters, Mrs. J. E., Ames, Story
Wortishek, Anna, Cedar Rapids, Linn
Wortishek, Mary, Cedar Rapids, Linn

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|---|---|
| Wright, Mrs. C. N., Ames, | Story |
| Yingst, Clara B., State Center, | Marshall |
| Young, Olive, Cedar Falls, | Black Hawk |
| Zunkel, Ila, Boxholm, | Boone |
| Zunkel, Mrs. J. J., Boxholm, | Boone |

## In Engineering

| *Name and Town* | *County* |
|---|---|
| Bates, W. S., Ames, | Story |
| Bauniger, W. M., Minneapolis, | *Minnesota* |
| Beatty, R. T., Minneapolis, | *Minnesota* |
| Bedwell, G. F., Perry, | Dallas |
| Beverness, W. J., Logan, | Harrison |
| Bichel, K. D., McGregor, | Clayton |
| Black, Evan M., Waterloo, | Black Hawk |
| Brims, J. F., Cedar Rapids, | Linn |
| Burns, Jay, Omaha, | *Nebraska* |
| Carlson, E. C., Minneapolis, | *Minnesota* |
| Durbin, Otis B., Kansas City, | *Missouri* |
| Faulkner, J. G., Des Moines, | Polk |
| Fritch, E. B., Cincinnati, | *Ohio* |
| Haglunds, Ed., Davenport, | Scott |
| Hall, B. C., Manchester, | Delaware |
| Hanson, R. N., Des Moines, | Polk |
| Himmulman, Carl, Des Moines, | Polk |
| Jacobsen, E. S., Chicago, | *Illinois* |
| Johnson, J., Omaha, | *Nebraska* |
| Johnson, James, Boone, | Boone |
| Jungk, Leo A., Dubuque, | Dnbuque |
| Knudson, O. A., Ames, | Story |
| Kuenne, O., Omaha, | *Nebraska* |
| Kurts, S. C., Ames, | Story |
| Landis, G. F., Dunlap, | Harrison |
| Lorrimer, A. L., Winterset, | Madison |
| Lyon, L. G., Washington, | Washington |
| Markey, J. J., Omaha, | *Nebraska* |
| Naughtin, T. F., Omaha, | *Nebraska* |
| Neff, V. R., Cameron, | *Missouri* |
| Neofolish, Gust, Des Moines, | Polk |
| Penney, C. R., Cincinnati, | *Ohio* |
| Raynes, E. G., Ames, | Story |
| Ross, H. R., Woodward, | Dallas |
| Ross, L. H., Woodward, | Dallas |
| Rowland, A. J., Boone, | Boone |
| Schmidt, W. F., Mason City, | Cerro Gordo |
| Smith, J. L., Ottumwa, | Wapello |
| Stark, Guy, Leon, | Decatur |
| Sterling, J. G., Minneapolis, | *Minnesota* |
| Stinger, O. A., Cresco, | Howard |
| Strauss, F. W., Charles City, | Floyd |
| Sybenga, J. G., Pella, | Marion |
| Todd, J. H., Villisca, | Montgomery |
| Waller, R. A., Macon, | *Missouri* |
| Zinsmaster, M., Des Moines, | Polk |

## VETERINARY PRACTITIONERS

| *Name and Town* | *County* |
|---|---|
| *Regular College students | |
| Abarr, R. D., Blockton, | Taylor |
| Abarr, A. J., Clearfield, | Taylor |
| Austin, W. H., Gilman, | Marshall |
| Albright, W. V., Fredericksburg, | Chickasaw |
| Allen, R. M., Marshaltown, | Marshall |
| Baxter, C. E., Oakland, | Pottawattamie |
| Blanche, G. W., Belle Plaine, | Benton |
| Beck, A., Auburn, | Sac |
| Ball, Roy C., Titonka, | Kossuth |
| Born, A. L., Story City, | Story |
| Bauman, S. H., Birmingham, | Van Buren |
| Brill, J. A., Dow City, | Crawford |
| Buck, A. P., Boone, | Boone |
| Bergman, H. D., Ames, | Story |
| Buxton, E. A., Vinton, | Benton |
| Bossenberger, W. P., Williams, | Hamilton |
| Baker, G. G., Spencer, | Clay |
| Beezley, L. P., Essex, | Page |
| Brenton, C. R., Dallas Center, | Dallas |
| Baughman, D. E., Ft. Dodge, | Webster |
| Christopher, W. F., La Porte City, | Black Hawk |
| Cole, C. G., Ames, | Story |
| Cline, J. D., Clarion, | Story |
| Clay, C. C., Menlo, | Guthrie |
| Cecil, J. D., Waterloo, | Black Hawk |
| Copenhaven, J. H., Omaha, | *Nebraska* |
| Covault, C. R., Ames, | Story |
| Deming, S. A., Ida Grove, | Ida |
| Dimock, W. W., Ames, | Story |
| Dickens, M. E., Washington, | Washington |
| Dorewiler, P. O., West Bend, | Palo Alto |
| Deiling, N. J., Dallas Center, | Dallas |
| Dixon, James, Tipton, | Cedar |
| *Dukes, H. H., Ames, | Story |
| Edwards, F. H. P., Iowa City, | Johnson |
| Ellis, P. L., Merrill, | Plymouth |
| Fox, L. W., Algona, | Kossuth |
| Finley, E. L., Waverly, | Bremer |
| Ferrand, W. S., Gilmore City, | Pocahontas |
| *Fincham, G. B., Ames, | Story |
| Garman, C. E., Nora Springs, | Floyd |
| Grossman, James D., Ames, | Story |
| Glenn, J. C., Norway, | Benton |
| Gidley, Thomas W., Malvern, | Mills |
| Guard, W. F., Ames, | Story |
| Glover, E. K., Kansas City, | *Missouri* |
| Gibson, J. I., Des Moines, | Polk |
| Griffith, J. W., Cedar Rapids, | Linn |
| Goode, A., Milo, | Warren |
| Hines, F. A., Gravity, | Taylor |
| Hanson, W. L., Greene, | Butler |
| Himmelberger, L. R., Ft. Dodge, | Webster |
| Hughes, Guy, Corydon, | Wayne |
| Hinken, A. H., Sheffield, | Franklin |
| Heckard, C. J , Wheatland, | Clinton |
| Huston, S. S., Jefferson, | Greene |
| Hipschen, P J., Marcus, | Cherokee |
| *Hewitt, E A., Ames, | Story |
| Hesse, F. J., Dyersville, | Dubuque |
| Heck, W. K., West Liberty, | Muscatine |
| Hazlet, S. K., Oelwein, | Fayette |
| Jongewaard, N. R , Sioux Center, | Sioux |
| Jacobs, W. F., Nashua, | Chickasaw |
| Juhl, C. E., Osage, | Mitchell |
| *Jones, Guy, Tabor, | Fremont |
| Johnston, S. H., Carroll, | Carroll |
| Kay, C. A., Harlan, | Shelby |
| Kippen, W. A., Independence, | Buchanan |
| Haderbek, A., Ft. Dodge, | Webster |
| Kellogg, L. W., Hull, | Sioux |
| Little, C. L., Lohrville, | Calhoun |
| Lovesee, R. G., Kingsley, | Plymouth |
| Leith, T. S., Ames, | Story |
| Larson, F. W., Sioux City, | Woodbury |
| Lavender, J. B., Churdan, | Greene |
| Lumb, J. W., Sioux City, | Woodbury |
| Morgan, C. M., Manchester, | Delaware |
| Moeller, W. A., Pocahontas, | Pocahontas |
| Macklin, W. E., Coon Rapids, | Carroll |
| Moore, C. G., Toledo, | Tama |
| Morris, H. R., Omaha, | *Nebraska* |
| Miller, D. H., Council Bluffs, | Pottawattamie |
| Murphey, H. S., Ames, | Story |
| Murray, Chas., Ames, | Story |
| Moore, Robert G., Dunlap, | Harrison |
| Maxfield, F. M., Tama, | Tama |
| Middleton, A. C., Grundy Center, | Grundy |

Mosey, C. Q., Mt. Vernon, Linn
Malcombe, P., New Hampton, Chickasaw
Miller, W. J., Indianola, Warren
McGreevy, A. F., Marathon, Buena Vista
McCabe, J. C., Oxford Junction, Jones
McLeod, J. H., Charles City, Floyd
McElyea, Lew W., Ames, Story
McKellar, A. H., Watetrloo, Black Hawk
McGrath, J. L., Jesup, Buchanan
*MacDonald, J. R., Ames, Story
McNutt, S. H., Ames, Story
McNutt, S. H., Stratford, Hamilton
Piper, E. G., Ida Grove, Ida
Patterson, John, Hedrick, Keokuk
Phelps, C. D., Eldora, Hardin
Orr, H. W., Ames, Story
Rosengren, M. W., Ackley, Hardin
Robinson, V. J., Atlantic, Cass
Reid, F. E., Wellman, Washington
Rice, C. D., Ames, Story
Simmons, G. P., Union, Hardin
Strandberg, J. J., Dayton, Webster
Smith, W. A., Rock Valley, Sioux
Statter, C. P., Sioux City, Sioux
Stouder, K. W., Ames, Story
Simpson, Hal C, Denison, Crawford
Sheumaker, E. C., Mt. Ayr, Ringgold
Sheumaker, R. D., Tingley, Ringgold
Swanson, A. C., Webster City, Hamilton
Stewart, H. L., Charlton, Lucas
Schoenenberger, J. G., Winterset, Madison
Stange, C. H., Ames, Story
Scott, George A., Waterloo, Black Hawk
Scott, C. J., Knoxville, Marion
Shipley, L. U., Sheldon, O'Brien
Strain, C. B., Dunkerton, Black Hawk
Schalk, K. W., Iowa Falls, Hardin
*Stevenson, B. M., Rockwell City, Calhoun
Trafton, R. E., Paton, Greene
Treman, A. J., Lake City, Calhoun
Treman, H. B., Rockwell City, Calhoun
Thomsen, J. F., Gladbrook, Tama
Templeton, E. G., Nevada, Story
*Verploeg, W. C., Ames, Story
Wagoner, T. J., Dumont, Butler
Wood, A. L., Hampton, Franklin
Ward, B. F., Jr., Anthon, Woodbury
Willey, L. E., Ames, Story
White, L. A., Paton, Greene
Wesson, H. R., Scranton, Greene
Williams, J. J., Ft. Dodge, Webster

# Summary of Enrollment

## 1917-1918

## BY DIVISIONS, YEARS AND COURSES

### 1—Graduate Division

| | | | |
|---|---|---|---|
| **Agriculture** | | | |
| Agricultural Education | 1 | | |
| Agricultural Engineering | 4 | | |
| Animal Husbandry | 7 | | |
| Dairying | 5 | | |
| Farm Crops and Soils | 12 | | |
| Farm Management | 3 | | |
| Horticulture | 5 | | |
| | | 37 | |
| **Engineering** | | | |
| Agricultural Engineering | 4 | | |
| Architectural Engineering | 1 | | |
| Mechanical Engineering | 1 | | |
| | | 6 | |
| **Industrial Science** | | | |
| Bacteriology | 7 | | |
| Botany | 16 | | |
| Chemistry | 20 | | |
| Economic Science | 5 | | |
| Mathematics | 9 | | |
| Physics | 2 | | |
| Zoology | 3 | 62 | |
| **Veterinary** | 2 | 2 | |
| | | | 107 |

### 2—Division of Agriculture

| | | | |
|---|---|---|---|
| **Senior Class** | | | |
| Agricultural Education | 10 | | |
| Agricultural Engineering | 7 | | |
| Animal Husbandry | 79 | | |
| Dairying | 9 | | |
| Farm Crops and Soils | 14 | | |
| Farm Management | 10 | | |
| Forestry | 4 | | |
| Horticulture | 4 | | |
| | | 137 | |
| **Junior Class** | | | |
| Agricultural Education | 6 | | |
| Agricultural Engineering | 5 | | |
| Animal Husbandry | 64 | | |
| Dairying | 5 | | |
| Farm Crops and Soils | 14 | | |
| Farm Management | 4 | | |
| Forestry | 5 | | |
| Horticulture | 5 | | |
| | | 108 | |
| **Sophomore Class** | | | |
| Agricultural Education | 4 | | |
| Agricultural Engineering | 11 | | |
| Animal Husbandry | 98 | | |
| Dairying | 6 | | |
| Farm Crops and Soils | 22 | | |
| Farm Management | 10 | | |
| Forestry | 10 | | |
| Horticulture | 11 | | |
| Two-year Collegiate Agriculture | 26 | | |
| | | 198 | |
| **Freshman Class** | | | |
| Agricultural Engineering | 19 | | |
| Agriculture | 249 | | |
| Forestry | 13 | | |
| | | 281 | |
| **Specials** | | | |
| Agriculture | 5 | | |
| | | 5 | |
| **Irregular** | | | |
| Agriculture | 6 | | |
| | | 6 | |
| **Correspondence** | | | |
| Agriculture | 11 | | |
| | | 11 | |
| **Non-Collegiate** | | | |
| Two-year Agriculture | 159 | | |
| One-year Dairy | 39 | | |
| Six-Weeks Garden Club Leaders | 9 | | |
| | | 207 | |
| **Winter Short Course** | | | |
| Agriculture | 1431 | | |
| Juniors | 544 | | |
| | | 1975 | |
| | | | 2928 |

### 3—Division of Engineering

| | | | |
|---|---|---|---|
| **Senior Class** | | | |
| Agricultural Engineering | 7 | | |
| Architectural Engineering | 7 | | |
| Chemical Engineering | 5 | | |
| Civil Engineering | 27 | | |
| Electrical Engineering | 24 | | |
| Mechanical Engineering | 11 | | |
| | | 81 | |
| **Junior Class** | | | |
| Agricultural Engineering | 5 | | |
| Architectural Engineering | 8 | | |
| Ceramics | 1 | | |
| Chemical Engineering | 8 | | |
| Civil Engineering | 21 | | |
| Electrical Engineering | 36 | | |
| Mechanical Engineering | 9 | | |
| Mining Engineering | 2 | | |
| | | 90 | |
| **Sophomore Class** | | | |
| Agricultural Engineering | 11 | | |
| Architectural Engineering | 13 | | |
| Ceramics | 3 | | |
| Chemical Engineering | 11 | | |
| Civil Engineering | 19 | | |
| Electrical Engineering | 48 | | |
| Mechanical Engineering | 23 | | |
| Mining Engineering | 2 | | |
| | | 130 | |
| **Freshman Class** | | | |
| Agricultural Engineering | 19 | | |
| Architectural Engineering | 29 | | |
| Ceramics | 2 | | |
| Chemical Engineering | 29 | | |
| Civil Engineering | 48 | | |
| Electrical Engineering | 82 | | |
| Mechanical Engineering | 58 | | |
| Mining Engineering | 2 | | |
| | | 269 | |
| **Specials** | | | |
| Engineering | 1 | | |
| | | 1 | |

| | | | |
|---|---|---|---|
| Irregulars | | | |
| Agricultural Engineering | 1 | | |
| Civil Engineering | 1 | | |
| Engineering | 2 | | |
| | | 4 | |
| Non-Collegiate | | | |
| Vocational Work in Engineering | 121 | | |
| | | 121 | |
| Winter Short Courses | | | |
| Engineering | 46 | | |
| | | 46 | |
| | | | 742 |

## 4—Division of Home Economics

| | | | |
|---|---|---|---|
| Senior Class | 96 | | |
| Junior Class | 97 | | |
| Sophomore Class | 154 | | |
| Freshman Class | 172 | | |
| Specials | 7 | | |
| Irregulars | 5 | | |
| Non-Collegiate Two-Year | 42 | | |
| Winter Short Course | | | |
| Home Economics | 475 | | |
| | | 1048 | |
| | | | 1048 |

## 5—Division of Industrial Science

| | | | |
|---|---|---|---|
| Senior Class | 9 | | |
| Junior Class | 10 | | |
| Sophomore Class | 20 | | |
| Freshman Class | 42 | | |
| Specials | 2 | | |
| Irregulars | 2 | | |
| Non-Collegiate Music | 86 | | |
| | | 171 | |
| | | | 171 |

## 6—Division of Veterinary Medicine

| | | | |
|---|---|---|---|
| Senior Class | 29 | | |
| Junior Class | 30 | | |
| Sophomore Class | 31 | | |
| Freshman Class | 24 | | |
| Winter Short Course | | | |
| Veterinary Practitioners | 138 | | |
| | | 252 | |
| | | | 252 |

## 7—Summer School

| | | | |
|---|---|---|---|
| First Session | 570 | | |
| Second Session | 116 | | |
| | | 686 | |
| | | | 686 |
| Total | | | 5934 |
| Less Duplicates | | | |
| Agricultural Engineering | 47 | | |
| Animal Husbandry and Veterinary Medicine | 2 | | |
| Home Economics and Agriculture | 23 | | |
| Industrial Science and Veterinary Medicine | 1 | | |
| Non-Collegiate Music | 67 | | |
| Summer Session | | | |
| In Both Sessions | 67 | | |
| Regular College Students | 576 | | |
| | | 643 | |
| Winter Short Course | | | |
| In Two Sessions | 101 | | |
| Regular College Students | 29 | | |
| | | 130 | |
| | | | 913 |
| | | | 5021 |

## BY GRADES

| | | | |
|---|---|---|---|
| Collegiate | | | |
| Graduate | | 107 | |
| Agriculture | | 746 | |
| Engineering | | 575 | |
| Home Economics | | 581 | |
| Industrial Science | | 85 | |
| Veterinary Medicine | | 114 | |
| Total | | 2158 | |
| Less Duplicates | | 67 | |
| | | 2091 | |
| Non-Collegiate | | | |
| Agriculture | | 207 | |
| Vocational Engineering | | 121 | |
| Two-Year Home Economics | | 42 | |
| Music | | 86 | |
| Total | | 456 | |
| Less Duplicates | | 73 | |
| | | 383 | |
| Net Total of Collegiate and Non-Collegiate | | | 2474 |
| Summer Session | | | |
| First Session | | 570 | |
| Second Session | | 116 | |
| Total | | 686 | |
| Less Duplicates | | 643 | |
| | | | 43 |
| Net Total of Collegiate, Non-Collegiate and Summer Session | | | 2517 |
| Winter Short Course | | | |
| Agriculture | | 1431 | |
| Juniors | | 544 | |
| Engineering | | 46 | |
| Home Economics | | 475 | |
| Veterinary Practitioners | | 188 | |
| Total | | 2684 | |
| Less Duplicates | | 180 | |
| | | 2504 | |
| Grand Total (Net) | | | 5021 |

# Summary of Graduates

## 1917

| | Including 1917 | 1917 |
|---|---|---|
| **Number of Baccalaureate degrees granted 1872-1917** | **4446** | **409** |
| **Present Courses** | | |
| Agricultural Education, 1913-1917 | 44 | 7 |
| Agricultural Engineering, 1910-1917 | 95 | 26 |
| Agronomy, 1905-1917 | 220 | 29 |
| Animal Husbandry, 1904-1917 | 553 | 90 |
| Ceramics, 1910-1917 | 8 | 2 |
| Chemical Engineering, 1910-1917 | 8 | 1 |
| Civil Engineering, 1872-1917 | 635 | 31 |
| Dairying, 1904-1917 | 96 | 6 |
| Electrical Engineering, 1892-1917 | 454 | 29 |
| Farm Management, 1917 | 1 | 1 |
| Home Economics, 1907-1917 | 359 | 91 |
| Horticulture and Forestry, 1904-1917 | 107 | 16 |
| Industrial Science, 1875-1917 | 561 | 22 |
| Mechanical Engineering, 1872-1917 | 379 | 29 |
| Mining Engineering, 1907-1917 | 59 | 1 |
| Veterinary Medicine, 1880-1917 | 382 | 23 |
| Structure Design, 1916-1917 | 7 | 5 |
| **Courses Discontinued** | | |
| Agricultural Course, leading to Degree B. S., 1872-1880 | 102 | |
| Agricultural Course, leading to Degree B. S. A., 1883-1888 and 1894-1904 | 86 | |
| Science and Agriculture Course, leading to Degree B. S., 1889-1890 and 1909-1914 | 50 | |
| General Science Course for Ladies, 1872-1880 and 1904 | 48 | |
| General and Domestic Science Course, leading to Degree B. L., 1887-1899 | 93 | |
| General and Domestic Science Course, leading to Degree B. Ph., 1899-1900 | 21 | |
| General and Domestic Science Course, leading to Degree B. S., 1901-1908 | 78 | |
| Agronomy Course, leading to Degree B. Ag., 1891-1898 | 50 | |
| | 4446 | 409 |
| **Higher Degrees, 1872-1917** | | |
| Doctor of Philosophy | 4 | 3 |
| Master of Science in Agricultural Lines | 131 | 28 |
| Master of Science | 85 | 19 |
| Other Master's Degrees | 18 | 0 |
| Engineers | 114 | 9 |
| Honorary Degrees | 19 | 0 |
| Advanced Degrees in Veterinary Medicine | 4 | 0 |
| | 375 | 59 |

# Index